



Bio – Surveillance and Biosecurity: A Promising action to stop the incidence of Digital Dermatitis in dairy Cows

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Bovine Digital Dermatitis (BDD) has been found a reputation of being cosmopolitan, emerging with apparent infectious nature. It negatively affects animal welfare and production. Body of evidences indicates that BDD is a multifactorial, Involving environmental management and microbial factors and currently is the Problematic infectious skin disease frequently in dairy cattle with lameness various solution have come in and out of fashion without any Justification and still had a lot of question marks regarding origin / source. Skin of digital region mostly at the planter and dorsal aspects of the interdigital space is a target zone for lesion development. It was stated that any breach in the normal skin structure from direct abrasion or chemical contact with the skin, will allow micro - organisms to invade the underlying tissues and provoke an associated inflammatory response where the local body defence mechanisms have limited access to such a lesion, the infection may not be contained and either the integrity of that tissue or the health of the whole body can be compromised. Today it was cleared that BDD is patently a disease with very significant bacterial involvement , group of Treponema and plenty opportunistic Invaders of tissues was blamed for such infection .Treponema medium, T. venticentti – link , T. denticola / T.

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Putidum – link all are three polyogroups of Treponema consistently identified together in typical BDD foot lesion . it is still unclear whether the Treponema's are merely secondary invaders or have a primary role in lesion development . Since the first reported outbreak of BDD from PO valley, Millan. Italy on 1974, the clinical picture of BDD lesions and the panorama of disease changed significantly due to aggressive medicament and not correct way of treatment. The 5 lesion stages by using the so – called “M-Stage” classification system making accurate assessment of BDD lesion transmissions for control treatment Policy to be taken at Prompt action .M., early, small circumscribed red to gray epithelial defects less than 2cm in diameter that may spontaneously resolve or precede into acute stages of DD(M2) .In addition , M1 stage can appear between acute episodes of lesion or within the margins of a chronic M4 lesion as an intermediate stage . M2 acute , active ulcerative (bright red) or granulomatous (Red – gray)digital skin alteration ,> 2cm in diameter , commonly found along the coronary band in addition to around the dew claws , in wall cracks and occasionally as a sole defect . M3 , healing stage within 1to 2 days after topical therapy , where the acute DD lesion has covered itself with a firm



scab – like material . M4, late chronic lesions that may be dyskeratotic (Mostly thickened epithelium), proliferative or both . Lesions may be filamentous, scab – like or mass proliferations. M4.1 consisting of a chronic M4 Lesion with an early or intermediate M1 lesion within its perimeter. Reducing the number of individual cases of M2 lesion through early detection and treatment is crucial disease management. In this regard healing lesion with a small ulcerated lesion on the top of the healing lesion (M4-1) may perpetuate infection within a herd. Based on the principles of moist wound healing, the wound dressing serves as a reaction chamber for immune cells and provides a transport for body's own regeneration process. Therefore, supporting the natural healing process, stimulating natural function, painful lesions caused by BDD are rational. It was claimed that topical application containing copper and zinc sulfate have achieved cure rates comparable to antibiotic treatment. Should keep in mind cure is defined the transition of M2 lesion into a healing (M0) or a non-painful chronic stage (M4) at day 28 after initiation the treatment. It seems the epidemiological pattern of BDD has been missed interpreted and there is a need to be asked of why, when and how it comes to a herd, stay there and not wish to go out. The transmission between cattle is unclear, the foot to foot contact, direct skin to skin contact have not clarified yet and the questions of what are the reservoirs of Treponema infection in cows or on farm environment, how are the Treponema's transmitted between cows in herd still remained to be answered and in one word where the "NICHE " must be , may be as biofilm.

Recent evidences put stress on the invasion of Treponema's to the necrotic tissues, and non-healing hoof lesion such as toe necrosis. These should be considered as reservoirs of infection. Chronic lesions (M4) could be acted as the long term reservoirs of pathogens and the precursors of active lesion. Increased chronic lesion become a problem under the impact of risk factors such as bad hygiene. Several alternative niches for BDD treponemes have been claimed. It may survive in environment slurry and on the skin surface at least for short periods of time. This might suggest that direct skin contact or short term persistence in slurry could be the rout for DD Treponema transmission, but controversy exist. On potential means of controlling infection is this disruption of transmission, however, the infection reservoirs and transmission routes of BDD have yet to be elucidate. To this end organized bio- surveillance and treatment plan also showed that individual cow factor play an important role in the development of the visible lesions of Digital Dermatitis and that this may be independent of serological response recently advised. The two components of biosecurity measures namely, bio-exclusion, relates to preventive measures (risk reduction strategies) designed to avoid the introduction of pathogenic infections (Hazards) and bio- containment relates to measures to limit within – farm transmission of infectious hazards and onward spread to other farms. The implementation of these plans showed how they act properly to minimize the risk of acquiring more sever forms BDD in endemically infected herds. Without asking for anything in return, as recently stated, using the Mastitis



Analogy , Digital Dermatitis can be considered as “ Mastitis of Foot” then dry period infections are of importance and hence dry cows, pre-calving heifers, young heifers and premature calves needed to be monitored and acted on. Last not least, intensive intervention programs based on active long-term DD surveillance ,mitigation of risk factors and prompt treatment are expected to increase overall animal well being and farm profitability by minimizing the effect of DD especially during the first lactation. On the final words as distinguished professor Nigel B. Cook stated in his interesting article recently published in the AABP Proceedings book ,Vol.48,2015, page

88, given the UBIQUITY of the condition .it is likely that BDD deserves the title of being the most infectious disease present on modern dairy operation.

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References :

- 1 – Clegg S.R et al.,2016: Bovine Ischemic Teat Necrosis: A Future Potential Role for Digital Dermatitis Treponems . Veterinary Record. January 16 .
- 2 – Apply M.D .2016 : Clinical Evidence for Individual Animal for Papillomatou’s Digital Dermatitis (Hairy heel Wart) and Infectious Bovine Poddermatitis (Foot Rot). Vet Clin Food Anim , 31:81-95
- 3- Gomes A.,et al., 2015: First – Lactation Performance in Cows Affected by Digital Dermatitis during the rearing percid . J Dairy Sci, 98: 4487- 4498.
- 4 – Wilson – Welden J.H. et al ., 2015:The Etiology of Digital Dermatitis in Ruminants: Recent Perspective . Veterinary Medicine: Research and Reports, 6:155 – 164.
- 5- Maeve A. etal ., 2015:Digital Dermatitis in Dairy Cows :A Review of Risk Factors and Potential in susceptibility . Animals (Basel) 5(3) : 512 – 535
- 6 – Cook N.B. 2015: New Developments in Digital Dermatitis Control. The AABP Proceedings, 48: 88 -93
- 7- Gomez A., et al., 2015: The Effect of Digital Dermatitis on Hoof Conformation . J. Dairy Sci , 98-927 – 936
- 8 – Tomlinson D ., et al ., 2014:Digital Dermatitis , an Endemic claw Disease. What Can we do to control it ?Virginia state food Association &Nutritional Management “Cow” College PP:1-14



- 9 - Sayers R.G 2014: A survey of biosecurity – related practices, opinions and Communications across dairy farm Veterinarians and Advisors – The Veterinary Journal. 200:216 – 269
- 10 – Gomez A., et al ., 2014 : Immune Response against *Treponema SPP* . Anelisa detection of Digital Dermatitits .J. Dairy Sci , 97:4864- 4875
- 11 – O’Connell N.E. 2014: Practical solutions to Digital Dermatitis Problems. Proceedings of the Cattle lameness Conference, sixways , Worcester , UK :49 – 53
- 12 – Carter S. 2014 : Digital dermatitis –how is it spread and can we stop it ? Proceedings of the Cattle Lameness Conference , sixways Worcester , UK , :43 – 48
- 13 - Kitgaard K., et al ., 2014 : Discovery of Bovine digital Dermatitis – Associated *Treponema spp.* In the dairy herd environment by A targeted deep – Sequencing approach .applied and Environmental Microbiology. 80(14) : 4427 – 4432
- 14 – Freestone P. 2013: Communication between Bacteria and their Hosts. Hind awi Publishing Cooperation Scientifica : 1 -15
- 15 – Refaai w., et al., 2013: Infectious Diseases Causing Lameness in Cattle with a main emphasis on Digital Dermatitis (Mortellaro Disease). Livestock Science. 156:053- 63
- 16 – Sayers R.G., et al., 2013: Implementing Biosecurity Measures on Dairy Farms in Irland . The Veterinary Journal , 197:259 - 267
- 17 – Brennan M.L., et al., 2012 :Biosecurity on Cattle Farms : A study in North – west England . Plose one . 7 (1): 1-8
- 18 – Nilsen B. H. 2012 : A study of the Dynamics of Digital Dermatitis in 742 Lactating Dairy Cows . Preventive Veterinary Medicine, 104: 44- 52
- 19 – Capion .et al., 2012 : Infection dynamic of Digital Dermatitis in first – lactation Holstein Cows in an infected herd . J., dairy Sci ., 95: 6457 – 6464
- 20 – Berry S. L. , et at., 2012: Long – Term Observation on the dynamic of Bovine Digital Dermatitis lesions A California Dairy after topical treatment with leucomycin HCL. The Veterinary Journal. 193: 654 – 658
- 21 – Evans N. J., et al., 2012 : Host and Environment al reservoirs of Infection for Bovine Digital Dermatitis *Treponeme’s* . Veterinary Microbiology.156: 102 -109.
- 22 – Huxley J.N.2012: Lameness in cattle : An ongoing concern . the Veterinary Journal ., 193:610 – 611



- 23 – Mee J.F., et al., 2012: Bioexclusion of diseases from dairy and beef farms : risk of introducing infectious agents and risk reduction strategies . The Veterinary Journal. 194:143 – 150
- 24 – Santos T.M.A., et al., 2012: Microbial Diversity in Bovine Papillomatosis Dermatitis in Holstein dairy Cows from upstate New York. FEMS Microbiology Ecology . 79(2):518 – 529
- 25 – Gomes A.,etal., 2012: An experimental infection model to induce Digital Dermatitis infection in cattle .J. Dairy Sci.,95: 182 – 1830.
- 26 – Potterton S., et al., 2012: A review of the peer reviewed literature on the treatment and prevention of foot lameness in cattle published between 2000. and 2011 . Dairy co. , PP:102 .
- 27 – Evans N.J. et al., 2011: Association between Bovine Digital Dermatitis treponemes and a range of ‘Non – healing ‘ Bovine Hoof Disorders . Veterinary Record .168 :214 - 217
- 28 – Evans N.J., et al., 2011: Characterization of novel bovine gastro intestinal tract treponema isolates and comparison with Bovine Digital Dermatitis Treponemes. Applied and Environmental Microbiology . 77(1): 138 – 147
- 29 – Holzhauer C.J., et al., 2011 : Curative effect of topical treatment of Digital Dermatitis with a gel containing activated copper and zinc chelate . Veterinary Record, October 4 : 1- 4
- 30 – Gomez A., 2010 : Time budgets of lactating dairy cattle in commercial free stall herds. J. Dairy Sci. 93:5772- 5781.
- 31 – Vink W.D ., et al. 2009: Diagnostic assessment without Cut – offs : application of serology for the modelling of Bovine Digital Dermatitis infection . Preventive Veterinary Medicine .92: 235 – 248 .
- 32 – Manabe H., 2008: Treponema is live in the biofilm of digital dermatitis Proceedings of the 15th symposium and 7th Conference on Lameness in Ruminants ,Kuopio , Finland : 352 – 354
- 33 – Laven R.A. et al., 2007: the effect of pre – calving environment on the development of Digital Dermatitis in first lactation heifers .the Veterinary Journal ,174:310 – 315.
- 34 –Bergsten C. et al., 2006: Using a footbath with copper sulphate or per acetic acid foam for the control of Digital Dermatitis and Heel Horn Erosion in dairy herd .Proceedings of the 14th International Symposium and 6th Conference on lameness in Ruminants. Colonia, Uruguay, PP: 61 -62
- 35 – Demirhan I., et al., 2000 : Skin diseases of the bovine digital associated with lameness. Veterinary Bulletin 70(2) : 149 – 171



36 – Greeough P.R. et al ., 1981: Lameness in Cattle . and edition ., wright Sciethchnica, Publication UK, PP :151 – 169

37 – Greenough P.R. 197: Lameness in Cattle . 3rd edition, W.B. Saunders company. Philadelphia. USA. PP:89- 100.

38 – Cheli R.,et al., 1974: Digital dermatitis in Cattle . Proceedings of 8th International Meetings on Diseases of cattle.,208 -213

39 – Greenough P.R. etal.1972: Lameness in cattle. 1st Edition, J. B. Lippincott Company Philadelphia, USA.PP:142- 152.