Bovine lameness and digital dermatitis in dairy cows: updates on control and diagnostics approaches.

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Editorial

Sound feet and legs of dairy cows are essential for the animal health, productivity, and welfare. Bovine lameness is one of the major causes of economic losses in dairy production systems [1]. It ranks fourth after mastitis, infertility and metabolic diseases [2]. The disease poses a major welfare and economic problem for dairy cattle, which results in reduced milk yield, reduced feed intake, weight loss, high treatment costs, high culling rate, and reduced fertility of affected animals [3,4]. Claw disorders have been found to be the cause of more than 90% of all lameness cases observed in dairy cattle [5]. Digital dermatitis (DD) is an important ulcerative infectious disease affecting the bovine foot worldwide, and may affect over 80% of cows within a herd [6,7]. The prevalence of DD varies from country to another based on the risk factors related to the animal, environment and managerial conditions [6].

We should put in consideration the interrelationship between DD and Interdigital dermatitis (IDD). Although the incidence of IDD may be higher than 80% in farms with poor hygiene, it is usually an incidental finding as it rarely causes lameness [8]. The importance of IDD is the probability that it may play a role in the evolution of other infectious claw disorders such as foot rot, digital dermatitis, and heel erosion [9].

Treponema species-anaerobic fastidious spiral microorganisms-have frequently been found in large numbers, deep inside DD lesions, suggesting its involvement in causing DD [10]. Different species of *Treponema* has been isolated, identified and characterized in many countries [10,11]. *Treponema* species are notoriously difficult to maintain in culture, although some progress has been made in isolation from DD lesions. Furthermore, obtaining a non-contaminated, single spirochete strain cultures is difficult and time-consuming [12,13]. Serology tests such as ELISA, are commonly used for identification of antibodies of *Treponema* in the affected dairy cows [14,15], however, there is a shortage on the diagnostic performance of such test under natural field conditions from dairy cows.

The available diagnostics based on molecular detection techniques for *Treponema* have yet been well developed for screening or diagnostic application because of (a) the aetiology has not yet been completely clarified [16,17], (b) microbiological research of the DD-associated treponemes has been problematic, and (c) understanding of the immunology is limited. Furthermore, some treponemes-like spirochetes impair the innate immune system as well as wound repair functions, which may explain the persistent nature of the lesions [18].

Recently, pyrosequencing of the hypervariable regions of the 16S rRNA gene revealed the presence of different species and phylotypic groups among *Treponema* isolated from cattle suffering from DD [19,20]. These new methods gave new insights into the etiology of the disease and should allow to specifically targeting specific pathogenic lineages. Furthermore, implementing such techniques in identifying the infection reservoirs of DD treponemes and subsequently, the transmission routes is crucial to minimize the spreading of infections and controlling the DD occurrence effectively. Rapid identification and typing of pathogenic lineages of DD should enhance our understanding for the disease and improve the claw health management in dairy cows.

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