

Why different species of *Treponema* need each other to cause digital dermatitis lesions in dairy cattle

Caroline Beninger, Sohail Naushad, Karin Orsel, Jeroen De Buck¹

Department of Production Animal Health, Faculty of Veterinary Medicine, University of Calgary, Calgary, AB, Canada

¹Corresponding author. Jeroen De Buck, Department of Production Animal Health, Faculty of Veterinary Medicine, University of Calgary, 3330 Hospital Drive NW, Calgary, AB, T2N 4N1. Tel.: +1 (403) 220-5393; E-mail: jdebuck@ulcalgary.ca

Abstract. Digital dermatitis (DD), is the leading cause of lameness in Alberta dairy cattle present in 15% of cows and 94% of herds. DD is a painful, ulcerative or proliferative lesion that compromises animal welfare and leads to significant economic losses. Multiple species of *Treponema*, a pathogenic anaerobic bacterium, are consistently isolated from DD lesions and rarely isolated from healthy hooves. We believe there may be a relationship between *Treponema* species present and the severity of the lesion suggesting there may be interactions among *Treponema* species that are beneficial for their growth, virulence, and disease establishment and progression. Previous studies have shown *Treponema* species have metabolic and virulent factor dependencies on other species. These relationships suggest there are likely interactions between species that facilitate infection and growth leading to polytreponemal communities and disease progression to active, infectious stages. Once we establish the nature of the relationships among species, we can identify species and species combinations important to disease establishment and progression. Current treatment includes environmentally damaging chemicals and topical antibiotics, the efficacies of which remains uncertain. To improve current treatment and control, we are testing *Treponema* species and communities isolated from DD lesions for antibiotic and metal resistance. Preliminary results showed that 91% of DD lesions contained at least 2 of *T. medium*, *T. phagedenis* and *T. pedis* and 70% contained all 3 (n=23)

Our project will contribute new knowledge regarding DD disease etiology, *Treponema* species relationships, and species important in disease establishment and progression. We will identify targets for vaccine development, and treatment and control by determining which species are important in disease establishment and progression; thus, improving animal welfare and economic efficiency.