

A Population Dynamic Model For The Evaluation Of Intervention Strategies During The Group Management Of Digital Dermatitis In Dairy Cattle

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(Papillomatous) Digital dermatitis, (P)DD, is an infectious disease in cattle that leads to painful ulcerative lesions along the coronary band of the claws. It is dreaded because of the repeated outbreaks of lameness in cattle resulting in the need for a cost-effective strategy to prevent outbreaks of (P)DD.

Animal health managers are expected to confine animal husbandry systems to states defined by 'animal health and welfare' under economic constraints, but it is postulated that generic data analysis of incidence data of (P)DD have failed in aiding the management of (P)DD to the producers' satisfaction. Many if not all intervention studies are aimed at eliminating (P)DD together with risk factors and pathogens (the knock-out strategy) and not at modulating the population dynamics of disease towards the 'manageable state'. The mathematical model presented here aims at providing a transition model for the population dynamics in groups of cattle using records of four different stages of lesions (M1 to M4, Döpfer et al. 1997). Threshold values of 'manageable' (P)DD prevalence and the reproduction rate  $R_0$  are predicted from combinations of transitions: f.e. the healing or aggravation of lesions and the rapid first detection of acute lesions. Interventions can be simulated and the model can be fitted to real-world data from intervention trials to evaluate the effect of a management strategy aiming at reaching the 'manageable state'.

Applied mathematics may provide structures, which when interpreted as real entities may result in a cognitive aid in developing management strategies for animal husbandry and production diseases.