Digital dermatitis is a highly prevalent painful lesion affecting the feet in dairy cattle. Even though the pathogenesis has been subject of investigation since 1974, there is still a lack of knowledge about the spread of the disease among cows within a herd as well as between herds. The purpose of this study was to monitor transmission of digital dermatitis under experimental conditions between naïve heifers and affected animals, to monitor the changes in clinical appearance, microbial colonisation of the skin as lesions progressed and to apply a q-PCR for the detection of Treponema spp. in faecal samples. Eight heifers with clinical normal digital skin were housed with 5 heifers with severe digital dermatitis lesion for 8 weeks on a solid concrete floor with an accumulating layer of slurry. Digital skin was examined daily and lesions were clinically scored. Skin biopsies were taken from the healthy heifers at introduction and weekly from all lesions for histopathological evaluation and fluorescence in situ hybridization. None of the healthy heifers developed digital dermatitis and in 4 out of 5 infected heifers the lesions healed during the study. All samples from healthy skin were negative for Treponema spp. and one sample were positive for Dichelobacter nodosus. Colonization of healthy skin could not be identified in this study. There was no significant relation between clinical scoring of the lesions and histopathological score and the presence of Treponema spp. There were however a significant relation between the prevalence of Treponema spp. in the skin and severity of changes in epidermis and dermis. By qPCR all the healthy heifers were found to excrete Treponema spp. in their faeces.