Role of antimicrobial peptides in the control of periodontal disease in dogs: viability assays of two topical delivery systems

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Introduction

Periodontal disease (PD) affects approximately 80% of the dogs, being promoted by the development of microbial biofilms (dental plaque) in the periodontium, which progression leads to gingivitis and periodontitis1. Enterococcus spp. are frequently present in the dogs’ oral cavity, being related with PD development in these animals2. Due to their frequent multidrug-resistant profile, it is important to develop innovative therapeutic protocols to control enterococcal PD in dogs. A possible strategy is the application of nisin-containing delivery systems to allow the topical administration of this peptide to dogs, for which the guar-gum gel and a commercially available veterinary toothpaste have previously been demonstrated to be effective.

Main Goal

To evaluate nisin’s antimicrobial activity when incorporated in two delivery systems, guar-gum gel and a veterinary toothpaste (C.E.T® Enzymatic Toothpaste for Dogs and Cats), stored over a 6 months period under different temperatures.

Methods

Nisin was incorporated in both delivery systems at final concentrations ranging from 2.5 to 20 mg/mL. Formulations were stored at three temperatures (4ºC, 20ºC, 37ºC) for 6 months. Their antimicrobial activity was tested at three-time points (1, 3, 6 months), against 3 enterococci obtained from dogs with PD and a reference strain2. A spot-on-lawn assay was performed to test the viability of the guar-gum gel formulation, while for the toothpaste formulation an agar-well diffusion assay was applied. Evaluation of inhibition zone diameters was performed after 24 h of incubation at 37ºC.

Results/Discussion

The nisin-guar-gum formulation maintained its antimicrobial activity when stored for a minimum of 6 months independently of the storage temperature, probably due to the physical and chemical characteristics of the guar-gum gel (Figure 1). Different results were obtained for the toothpaste formulation. Full antimicrobial activity was maintained after 6 month storage at refrigeration temperature, while at room temperature (≈20ºC) a reduction in antimicrobial activity was observed regarding one isolate. Furthermore, when kept at 37ºC independently of the storage period, the supplemented toothpaste lost its antimicrobial ability.

In conclusion, the guar-gum gel represents the most effective nisin delivery system, with the potential to be considered a suitable vehicle for the topical administration of this peptide in the oral cavity of dogs for PD control.


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