

Abstract

The comparison of the effect of Polyethylenimine Nanodendrimer with chlorhexidine against the periodontal pathogens: An in vitro study

Introduction: Considering the importance of oral and dental health in maintaining the general health of the body and knowing that prevention is better than cure, to prevent the development of this disease, oral hygiene and elimination of pathogens are necessary. *Aggregatibacter actinomycetemcomitans* (Aa) and *Porphyromonas gingivalis* (Pg) bacteria are periodontal pathogenic bacteria. The fourth generation of Polyethyleneimine nanodendrimers (PEI ND G4) with amine terminal groups has a high antibacterial effect. The purpose of this study was to compare the antibacterial effect of PEI ND G4 and chlorhexidine on Pg and Aa bacteria in vitro.

Materials and methods: FTIR, FE-SEM and TEM analyzes were used to determine the structure and size of PEI ND G4. PEI ND G4 antibacterial features evaluated using paper disc diffusion, broth microdilution (Minimum Inhibitory Concentration -MIC and Minimum Bactericidal Concentration) methods. All experiments were performed according to the guidelines of Clinical and Laboratory Standards Institute (CLSI).

Results: The MIC of chlorhexidine for Pg and Aa bacteria were achieved 0.02% and 0.01%, respectively. The MBC of chlorhexidine for both types of bacteria were achieved 0.1%. The MIC of PEI ND G4 for Pg and Aa bacteria were 64 and 32 µg/ml, respectively. MBC of PEI ND G4 for Pg and Aa bacteria were 128 and 64 µg/ml, respectively. At the concentration of 0.1% chlorhexidine, the inhibition zone average for Pg and Aa bacteria was 20.65 and 23 mm, respectively. At the concentration of 128 µg/ml of PEI ND G4, inhibition zone average for Pg and Aa bacteria was 12.25 and 16 mm, respectively. One-way ANOVA statistical test with a confidence level of 95% showed that there is a significant relationship between the increase of chlorhexidine and PEI ND G4 concentration with the inhibition zone of Pg and Aa bacteria ($p < 0.05$).

Conclusion: The results of the experiments showed that PEI ND G4 and chlorhexidine have antibacterial effect on Pg and Aa bacteria.

Keywords: Polyethylenimine, 4th generation nanodendrimer, Pg and Aa bacteria, chlorhexidine, Periodontal disease.