Assessment of the Antibacterial Effects of Bismuth Nanoparticles against *Enterococcus faecalis*

Azita Azad, Sahar Rostamifar, **Farzan Modaresi**, Ali Bazrafkan, and Zahra Rezaie

Abstract

Introduction. *Enterococcus faecalis* (*E. faecalis*) is the most important species in dentistry and plays a significant role in the etiology of persistent apical lesions after root canal treatment. Up to date, the intracanal application of 2% chlorhexidine for 7 days is the best way to eliminate *E. faecalis.* However, due to the ability of this bacterium to persist and survive in harsh environments, many studies have been directed towards finding an alternative strategy for prevention or eradication of it. This study was conducted to investigate the effect of bismuth nanoparticles on *E. faecalis*, as an etiologic factor in recurrent root canal infections. *Methods*. Forty patients, referred to Endodontic Ward of Shiraz University of Medical Science for endodontic pretreatment, provided root canal samples. First, all samples were transferred in Enterococcosel broth and incubated. Then, samples which showed growth were plated on blood agar plates and incubated for further PCR procedure. Nanoparticle powder was dissolved in high-purity water, and the final concentration of bismuth nanoparticles (BiNPs) was measured by the spectrophotometer. Minimum inhibitory concentration (MIC) of BiNPs against *E. faecalis* was determined by microbroth dilution method according to methods for antimicrobial susceptibility tests. Also, bactericidal assays were conducted in Mueller-Hinton broth medium and reported as the concentration of BiNPs that reduced the viable bacterial count by 99.9%. *Results*. Of all samples, 77.5% revealed the presence of *E. faecalis* by PCR. Also, *E. faecalis* growth inhibition was observed at concentrations ranging from 0.625 μg/ml to 20 μg/ml (geometric mean: 2.337 μg/ml), and the MBC values were between 1.25 μg/ml and 40 μg/ml (geometric mean: 4.781 μg/ml), which in comparison with chlorhexidine, these values were about one-eighth of chlorhexidine. *Conclusion*. The experimental data suggest that bismuth nanoparticles could be an interesting alternative to combat *E. faecalis*, which, in view of the advantages mentioned for bismuth nanoparticle like inhibiting *Streptococcus mutans* biofilm formation and higher antibacterial activity compared to chlorhexidine, can be suggested to be used in different fields of dentistry.