Article

Evaluation of the Antimicrobial Effect of Ag Nanoparticles on Nickel–Titanium Archwires in the Presence of *Streptococcus mutans* Bacteria

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Abstract: In this study, Streptococcus mutans bacteria were tested on nickel–titanium archwires in the presence of silver nanoparticles (AgNPs) as coatings. As a growth control, a well containing the BHI broth and bacterial suspension without silver nanoparticles was inoculated. The test was carried out in triplicate. The NiTi archwires in the presence of artificial saliva were incubated at different exposure times between 0–24 h and 15–30 days, respectively. The archwires were then put in contact with S. mutans to evaluate the AgNPs bactericidal effect. The characterization of AgNPs with NiTi archwires was conducted using scanning electron microscopy (SEM), X-ray energy dispersive analysis (EDS), fast fourier transform (FFT), power spectral density (PSD), surface geometry analysis, metal relation analysis, and control process analysis. The results indicate that the bioelectric signal and chemical interaction of NiTi and Ag nanoparticles have an antibacterial effect. In this context, the high wavelength of 17.06 mm and the wave amplitude of 15.66 GL are representative of the light scattering and humidity of the system in which the bacteria and silver nanoparticles interact. The sizes of the Ag nanoparticles in the archwires were less than 150 nm. Under microaerophile conditions, the solution's pH and temperature were 7.0 at 37 ◦C, respectively. The NiTi archwires AgNPs functionality and relation to the minimum inhibitory concentration, dominant wavelength in power spectral density, and fast fourier transform analyses were investigated. The analysis was of the interaction between the high and low frequencies of the AgNPs-NiTi archwires and the S. mutans bacteria. This approach opens up a new route for the assessment and management of bacterial growth in various fluids by utilizing alternative biologically acceptable materials.



Biography:

Sebastián Lozoya, born in 1995, is a dental surgeon from Mexico who completed a master's degree in orthodontics from the Autonomous University of Chihuahua. He specializes in orthodontics and facial aesthetics, focusing on improving the stomatognathic system while enhancing facial harmony.

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