

عنوان مقاله:

Effect of Superparamagnetic Iron Oxide Nanoparticles on Dental Biofilm Formed on Polymethyl Methacrylate Surface

محل انتشار:

اولین همایش منطقه ای دستاوردهای نوین و پژوهشهای دانش بنیان در میکروبیولوژی و بیوتکنولوژی (سال: 1401)

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نویسندگان:

Fatemeh Rashidi - Department of microbiology and microbial biotechnolog, Faculty of sciences and biotechnology, University of Shahid Beheshti, Tehran, Iran

Hadi Maleki - Department of microbiology and microbial biotechnolog, Faculty of sciences and biotechnology, University of Shahid Beheshti, Tehran, Iran

خلاصه مقاله:

Background and Objective: Considering the direct relationship between dental plaques and primary tooth decay, gum infections (such as gingivitis and periodontitis), and chronic cardiovascular diseases, different strategies have been presented to deal with biofilms in the oral cavity. Among these strategies, metal nanoparticles, especially superparamagnetic iron oxide nanoparticles, are very important due to their anti-biofilm properties and ability to respond to an external magnetic field. Superparamagnetic iron oxide nanoparticles have different antibacterial mechanisms to remove dental plaques, including physical damage and increasing the permeability of the bacterial membrane, morphological change, intracellular accumulation, disruption of protein synthesis, and ultimately bacterial death. . Therefore, the aim of this research is to investigate the anti-biofilm effect of superparamagnetic iron oxide nanoparticles on the dental biofilm formed on the surface of polymethyl methacrylate. **Methods:** In this study, *Streptococcus mutans* bacteria, which is the main cause of primary tooth decay, was used to form biofilm on the surface of polymethyl methacrylate which was treated with plasma and covered with protein. Therefore three modes, including, integration of biofilm with nanoparticles with a mechanical stirrer, integration of biofilm with nanoparticles with the application of a magnetic field, and integration of biofilm with superparamagnetic iron oxide nanoparticles without using a magnetic field or mechanical stirrer, were compared. Then, they were examined by calorimetric method with crystal violet at the wavelength of 570 nm and MTT test in terms of viability (1% concentration of nanoparticles was used during the test). **Findings:** The obtained results showed that the use of a 1% suspension of superparamagnetic iron oxide nanoparticles in the presence of a mechanical stirrer or in the presence of an external magnetic field could significantly ($P\text{-value} \leq 0.05$) reduce the mass of *Streptococcus mutans* biofilm. The application of magnetic nanoparticles without any magnetic field or mechanical stirrer had no significant effect on biofilm reduction. **Conclusion:** Superparamagnetic iron oxide nanoparticles alone had no effect on bacterial viability, but in the presence of a mechanical stirrer or an external magnetic field, the biofilm mass was reduced.

کلمات کلیدی:

Dental biofilm, Polymethyl methacrylate surface, *Streptococcus mutans*, Superparamagnetic iron oxide nanoparticles

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