Abstract

Cytotoxicity Effect Survey of Polyethylenimine Nanodendrimer on Fibroblasts Cells

Introduction: Considering that studies have shown that microorganisms are less resistant to polyethyleneimine nanodendrimer, If the toxicity of polyethyleneimine nanodendrimer on dental fibroblast cells is insignificant or low, this substance can be used in mouthwashes, toothpastes, dental implants and in the composition of composite resins. Therefore, this study was conducted with the aim of determining the toxicity of polyethyleneimine nanodendrimer on fibroblast cells.

Materials and methods: In this experimental and laboratory study, fibroblast cells of HGF2PI2 human gingival cell line with code C166 were purchased from the National Centers of Genetic and Biological Reserves of Iran. In this study, 4^{th} generation Polyethyleneimine nanodendrimer (PEI ND G4) was used. MTT test was used to evaluate cellular toxicity. In order to investigate the effect of PEI ND G4 on the doubling time of fibroblast cells, different concentrations of PEI ND G4 (1, 4, 16, 32, 64 and 128 µg/ml) were added to the 12-well plate and placed in a greenhouse for 8 days under standard laboratory conditions and counted daily using a neubauer slide and a growth curve was drawn. After obtaining the data related to the growth curve, the population doubling time (PDT) was estimated through Peterson's equation. To compare the average cytotoxicity of different concentrations of PEI ND G4, analysis of variance and independent t-test were used for statistical analysis of data. SPSS version 26 software was used to perform these analyses.

Results: The results of the study showed that with the increase in the concentration of PEI ND G4, the cell viability of fibroblast decreased during the exposure time of 48 and 72 hours. Also, the results demonstrated that there is a statistically significant relationship between the increase in the concentration of PEI ND G4 (except in 1 µg/ml) and cytotoxicity compared to the negative control sample during the 48 and 72 h exposure time. Also, a statistically significant relationship was observed between the duration of exposure time and the cytotoxicity of PEI ND G4 ($p<0.05$). By comparing the growth of cells in the second to ninth days when exposed to concentrations of 1 to 128 µg/ml of PEI ND G4 with negative control samples, the T-test analyze showed that statistically there is no significant relationship between these two variables ($p>0.05$).

Conclusion: The results showed that the cytotoxicity of PEI ND G4 on the Fibroblast cell line is relatively low and it can be used as an antibacterial agent.

Keywords: Fourth Generation Polyethylenimine Nanodendrimer, Fibroblast Cells.