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In vitro comparison of antifungal effect of Silver nanoparticles, Titanium dioxide nanoparticles versus Nystatin on candida albicans after adding to Tissue Conditioner

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Background: Tissue conditioner is one of the most frequently used material in the dental removable prosthodontics. Since the introduction of this dental material, however, are susceptible to microbial and yeast contamination in the mouth, but it has been used successfully to improve tissue. The aim of this study was to evaluate the effect of adding titanium dioxide nanoparticles to the Tissue Conditioner that no have undesirable characteristics of other materials and compare with antifungal effect of Nystatin.

Materials and Methods: It is a 3 group Experimental study, disc samples (10 mm x 10 mm) of Tissue conditioner (GC Soft-Liner, GC cooperation, Tokyo, Japan) Containing silver nanoparticles (TiO_2-NPs) and Containing Nystatin were fabricated (0 ppm = control for both groups). After incubation time in 37°c the number of colonies grown in Sabouraud Dextrose Agar, were counted. Fungal growth was verified at 24 hrs and 72 hrs and after ten days (In this ten days samples washing daily).

Antifungal efficacy counted using this:

$$\text{AntiFungal Efficacy} = \frac{V_c - V_t}{V_c} \times 100$$

Number of viable fungal colonies of the positive control = V_c

Number of viable fungal colonies of the test specimen = V_t

One way ANOva used as statistical method using Stata software package 12.1 and $P<0.05$ setted as significance level.

Results: 30 samples in each group (90 at all), TiO_2-NPs combined to tissue conditioner displayed higher antifungal effects than Nysatatin on Candida Albicans in 24hrs and the anti-fungal effect increases with increasing concentrations of TiO_2-NPs But they have same effect in 72 hrs. When the samples washed within 10 days, there were no statistical difference .The control group did not have any anti-fungal properties. ($P > .05$)

Ag-NPs and TiO_2-NPs combined to tissue conditioner displayed the same antifungal effects on Candida Albicans and the anti-fungal effect increaseswith increasing concentrations of nanoparticles, But When the samples washed within 10 days, there were no statistical difference .The control group did not have any anti-fungal properties, too. ($P > .05$)

Antifungal efficacy was 41.65-$^+$13.10, 26.01-$^+$17, 36.54-$^+$15.56 for TiO_2-NPs, Nystatin and Ag-NPs, respectively.

Conclusion: Adding TiO_2-NPs to tissue conditioner than the addition of Nystatin, since TiO_2-NPs have good anti-fungal effect and TiO_2-NPs have no problems of Nystatin, can be considered a good alternative to Nystatin, and having have the same effect like Ag-NPs, but as using TiO_2-NPs is easier and cost effective than Ag-NPs, can be considered a good alternative to silver nanoparticles.

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