



Antifungal Effect of Surface Quick (HELVEMED) Solution on Candida Strains Isolated From Patients with Denture-Related Candidiasis

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Authors' contributions

This work was carried out in collaboration between all authors. Author JBT designed the study, wrote the protocol. Authors SARR and MRT performed the statistical analysis, managed the analyses of the study. Author SA managed the literature searches and wrote the manuscript. All authors read and approved the final manuscript.

Research Article

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ABSTRACT

Aim: Surface Quick, an alcohol-based solution has been prepared by HELVEMED Company and various advantages have been mentioned for it; however all these claims have not been assessed scientifically. This study evaluated the antifungal efficacy of Surface Quick solution on candida albicans species obtained from the patients with denture-induced candidiasis.

Study Design: This is an experimental study for evaluation of antifungal effect of surface quick solution.

Place and Duration of Study: This study was done in Oral medicine and microbiology department of Shahid Beheshti University of Medical Sciences, Tehran, Iran in 2012.

Methodology: In this experimental *in vitro* trial, standard Candida albicans species (PTCC 5027) were obtained and the samples were prepared from 30 patients with denture-

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induced candidiasis using sterilized swab. *Candida albicans* species were grown in the sabouraud dextrose agar medium and the diameter of the inhibitory zone were calculated after exposing the medium to Surface Quick solution. The difference of inhibitory zone diameter between men and women was statistically analyzed by Student t test and the association of the individuals' age and gender with inhibitory zone diameter was assessed by logistic regression analysis.

Results: The mean and standard deviation of the inhibitory zone diameter after exposing candida albicans species with Surface Quick solution was 10.13 mm and 3.33 mm. No significant differences were found between *candida albicans* species obtained from the male and female individuals. There was no significant association among participants' age and gender with the inhibitory zone diameter.

Conclusion: According to the results, Surface Quick solution was effective against *Candida albicans* species obtained from candidacies patients even in the least concentration. Therefore this solution could be used for surface disinfection caused by candida albicans.

Keywords: Oral candidiasis; surface quick; inhibitory zone; disinfectant.

1. INTRODUCTION

Despite, infection control procedures progress today; it remains a potential problem in dental treatment. Infection control is important for dentists from two directions: First, the dentist is dealing with oral mucosal surfaces that is the primary barrier for transmission of infection. Second, during majority of dental practices, dentists, assistants and equipment are contaminated with blood and saliva of patients. Also, many dental appliances cannot survive in temperatures required to heat sterilization. Therefore, if gas sterilization was not available, disinfection process can be done. The application of chemical solutions and antiseptic and hand washing with antimicrobial agents are most effective ways to remove pathogens from dental environment.

The effectiveness of disinfectant material is divided to low, intermediate and high. Such alcohol-based m disinfectants are widely used in dental treatment. Alcohol-based materials typically moderate effects and sometimes are bactericidal. These materials are widely used for removing fungi from surfaces and dental instruments [1,2].

Candida is natural oral flora in 20%-50% of healthy populations. Under favorable conditions, candida causes oral and systemic infections. The yeast forms of *Candida albicans* in the mouth can cause oral Candidiasis infection [3,4]. From the past years, the prevalence of oral candidiasis is increased and caused problems for patients, especially those wearing denture. Nystatin is used as standard treatment. Different disinfectants have been introduced and available in recent years by companies [5]. From alcohol-based disinfectants, Surface Quick spray by the HELVEMED Swiss company made and has been marketed since 2008 to disinfect medical and dental equipment. Dental practitioner considered Surface Quick solution due to rapid drying, mild flavor and lack of color ingredients. This liquid was ranked among the high level disinfectants and causes the loss of bacteria and fungi from dental device surfaces in a short time. Company claims that, this solution has Virocidal efficacy against HBV (hepatitis B virus), HCV (hepatitis C virus) and HIV (human immunodeficiency virus) and bactericidal effect on various strains of bacteria including *Mycobacterium tuberculosis* in less than 1 minute. Because this solution free from phenol and aldehydes; has not stimulatory effects on the skin [6]. However, despite claims by the company and its

use in clinics and dental offices, comprehensive research has not been done on the antifungal effectiveness on candida albicans. Hence, aim of this study was evaluation of antifungal effect of HELVEMED soluble on Candida albicans strains isolated from patients with denture-related candidiasis.

2. MATERIAL AND METHODS

Samples needed for research using PS vs. 2.1.31 (Power and sample size calculation software) were calculated. On this basis, with consideration of less than 5% significance level and test power 80%, to detect differences of 1-1.5 mm in diameter zone including one mm standard deviation in each group, 30 samples were evaluated.

Patients were selected by non-randomized simple Sampling approach. The research was performed experimental (*in vitro*) on 30 samples of *Candida albicans*. Standard strains of *C. albicans* used in this study purchased from the Institute of Scientific and Industrial Research of Iran with ID (PTCC 5027). Selected patients with clinical symptoms of denture candidiasis were sampled using a sterile swab. Samples put in to test tubes containing five ml medium Sabouraud Broth and quickly was transferred to laboratory and incubated 48 to 72 hours on 37°C. Then, yeast count per ml of fungal suspension was counted with opacity method Survey 0.5McFarland. Fungal Stoke used in this experiment contained 106 yeasts in each milliliters suspension. To determine the minimum inhibitory concentration HELVEMED solution, 96 well in a sterile micro plate by micro dilution methods was used. Also, each *C. albicans* were tested using the micro plate eight rows well. Well one to five in each row was considered for the dilution solution. In addition, the wells 6, seven and eight respectively for the positive control (nystatin), negative control (distilled water) and a test control (without yeast) was used. Total volume was equal to 200 micro liters for each well. Wells were added by 160 microliters of the broth poured and then 20 microliters of yeast suspension. Finally, up to well no. 5 of serial dilutions solution was added 20 microliters, respectively. Twenty microliters of positive control (nystatin) was added to well no. six. Normal saline was used instead of negative control. For evaluation effect of secondary contamination yeast was not used in the eight well. Finally, the entire micro plate coated and incubated in 37°C for 24 hours. To determine MIC, last house, which was not observed in yeast growth, was selected. To determine the minimum concentration of fungicides solution, after estimated MIC, MIC and the contents of the cell before the dilutions were cultured on agar surface. The last dilution of the solution, which did not grow any microorganisms on the agar surface, was chosen as the Fungicidal dilution. To determine the diameter of inhibitory zone of the solution creates hole on the agar was used. First, the surface plate with a suspension of yeast was cultured completely. Samples were cultured on each medium plate (diameter nine cm) and five hole was created using Puncher with two cm intervals from each other. Ring volume was about 50 micro liters. 40 microliters of dilutions of the MIC and pre-MIC was added to the well and a hole for each plate was considered as positive control group. This experiment was conducted with three replications for each *C. albicans* species. Then, culture plates were incubated for 72 hours in 37°C. After incubation period, using a caliper growth inhibition zone diameter were measured and recorded in mm. Data with statistical software statistical package for social sciences (SPSS) version 17 was analyzed.

3. RESULTS AND DISCUSSION

Based on survey results, the mean diameter of inhibition zone next to HELVEMED solution was 10.13 mm and its standard deviation equal to 3.33 mm. In addition, diameter of

inhibition zone in the samples was estimated at least equal to six mm and maximum to 16 mm. In Table 1, the frequency of different diameters of inhibition zone of *Candida* species obtained from the patients are shown. Average age of patients was 52.9 years (SD 9.5 years) and the minimum and maximum ages were 38 and 75 years respectively. Based on research results, growth inhibitions in male samples was equal to 3.5 ± 10.4 mm and the female samples equal to 3.2 ± 9.9 mm. *C. albicans* growth inhibitions in patients according to different age groups and sex are presented in Table 2. In Fig. 1, growth inhibition of samples is shown according to age groups. No significant difference between male and female samples from the mean diameter of inhibition zone was observed (student test t, $P=0.66$). Men and women differ for inhibition zone equal to 0.55 mm. By defining the growth inhibitions of less than ten mm and greater than or equal to ten mm, the relation between age and sex with growth inhibitions were evaluated using logistic regression analysis, but no significant correlations were found in this area.

Table 1. Different diameters of inhibition zone

Diameters of inhibition zone	Number	Percentage
6	5	.7%16
7	3	0.%10
8	4	3.%13
9	4	3.%13
10	2	76.%
11	1	.3%3
12	1	3.%3
13	4	3.%13
14	2	76.%
15	2	7.%6
16	2	76.%
	30	%100

Table 2. Diameter of inhibition zone by sex and age group

Age group	Sex	Mean	SD
Less than 50	Male	0.10	23.
	Female	88.	.22
	Total	5.9	2.8
50-60 years	Male	09.	53.
	Female	1.10	8.3
	Total	.89	63.
60-70 years	Male	13.1	34.
	Female	513.	7.0
	Total	13.2	1.3
More than 70	Female	.08	82.
	Total	8.0	82.
	Male	410.	.53
Total	Female	99.	23.
	Total	.110	33.

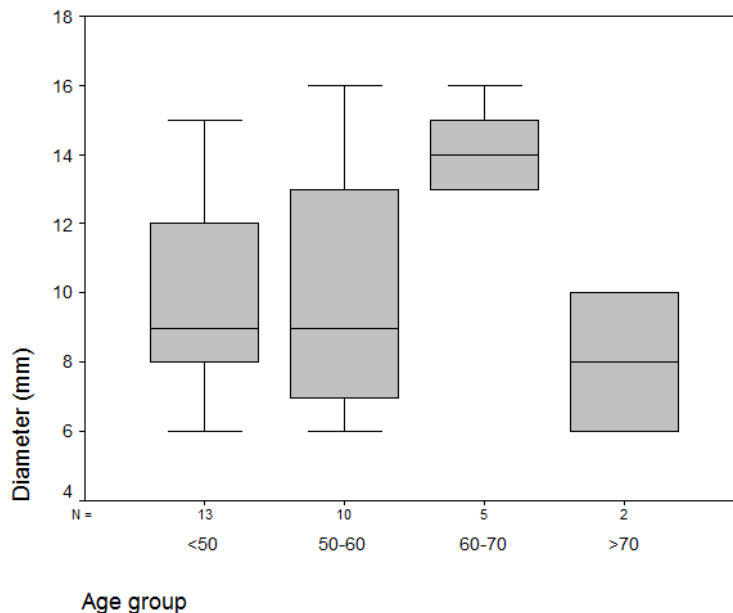


Fig. 1. Diameter of inhibition zone by age group

The results of this study showed that Surface Quick solution even the highest dilution (lowest concentration) against *Candida* species obtained from patients with oral candidiasis has been effective. On this basis, the average diameter of inhibition zone of HELVEMED Solution Company adjacent to *Candida* species was 10.13 mm and its standard deviation equal to 3.33 mm, respectively. Given these results this solution could be used for surface disinfection caused by *Candida albicans*.

So far, no research has been done about the effects of fungicides activity of Surface Quick solution on *Candida albicans*; of course, some research about different disinfected solutions has been done.

Barkvoll and colleagues [7] examined the effects of nystatin and chlorhexidine on *Candida albicans* species and a combination of two drugs showed a significantly greater amount of MIC values of each drug alone. Jainjittivong et al. [8] evaluated the effects of *Morinda citrifolia* extract against *Candida albicans* and showed that the extract of *M. citrifolia* has antifungal effect against *Candida albicans* species. Taheri and colleagues evaluated the efficacy of BIB forte as an antiseptic substance in High-Level for the elimination of common microbes found in the dental instruments and equipment. They showed that, disinfection with BIB forte solution could be decreasing the contamination from 93 % to less than 7% [9]. Also, Taheri and colleagues showed in another study, antiseptic solution SANOSIL reduce contamination of dental instruments apparently [10]. On the other hand, Christinsen [11] evaluated antimicrobial activity of 39 antiseptic product in six groups, alcohols, chlorine, diluted glutaraldehyde, iodine abundance, phenols and ammonium compounds in both the absence and presence of organic material and reported all the disinfectants were able to have a bactericidal effect on hospital infections.

Some opportunistic fungi in certain circumstances can cause disease in humans. Turnidge [12] *Candida* is yeast of natural flora in 20%- 50% healthy populations and oral *Candida*

infection in the presence of local or systemic predisposing factors for fungal growth occurs. [13] In addition, oral candidiasis among denture using patients, elderly patients and patients with HIV has been observed. Also, the risk of secondary candidiasis in patients with prolonged use of broad-spectrum antibiotics, corticosteroids and immunosuppressant, always has been considered. *C. albicans* is selected in this study and some other studies because this species, the most common microorganisms in the oral Candida infections. In addition, the Nystatin is selected as a positive control because of it's proven affects against Candida species. Surface Quick solution seems to be effective against *Candidia albicans*.

In this study, only a certain species of fungi have been reviewed and assessed and other antiviral and antibacterial properties of Surface Quick solution requires other studies. Also, Sen et al. [14] were reported in the disinfectants reactions may be affected by the conventional contents of medium and the content may also affect the results. Therefore, for use of disinfectant in clinical situations, it is necessary to conduct clinical research. Despite the acceptable results obtained from different antimicrobial products, should be noted that using disinfectant solutions in various forms, the only possible surfaces' contaminants are removed. In addition, according to change common infectious strains over time and the emergence of highly resistant and pathogen species, concern about resistance to antibiotics and disinfectants will always feel.

4. CONCLUSION

Surface Quick solution even the highest dilution (lowest concentration) against Candida species obtained from patients with oral Candidiasis has been effective. Given these results, it appears that Surface Quick HELVEMED Company solution could be used for surface disinfection caused by *Candida albicans*.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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