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Artigo Original de Pesquisa

Pacifier disinfection procedure: superficial morphological aspects and microorganisms colonization

Desinfecção de chupetas: aspectos morfológicos e colonização de microrganismos

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C. albicans; pacifier.

Abstract

Introduction and Objective: Evaluate superficial changes as well as the presence of *C. albicans* and *S. mutans* on latex and silicone pacifiers. **Material and Methods:** after thermal treatment and disinfection, forty latex and silicone pacifiers fragments were contaminated and submitted to boiling water during 5 and 10 minutes and microwave energy during 5 minutes. **Results:** Scanning Electron Microscopy revealed the greatest superficial alterations on latex samples compared to silicone. In despite of thermal treatment, none sample revealed the occurrence of *S. mutans* and *C. albicans*. **Conclusion:** Silicone pacifiers and the microwave energy showed to be the most appropriate and effective domestic procedure for disinfections of pacifiers.

Palavras-chave:

desinfecção; *S. mutans*;
C. albicans; chupeta.

Resumo

Introdução e objetivos: Avaliar as alterações superficiais e a presença de *C. albicans* e *S. mutans* na superfície de chupetas de látex e silicone. **Material e métodos:** Após tratamento térmico e desinfecção, 40 fragmentos de chupetas de látex e silicone foram contaminados e submetidos a fervura em água durante 5 e 10 minutos e forno de microondas por 5 minutos. **Resultados:** A análise por microscopia eletrônica de varredura revelou maiores alterações superficiais nas amostras de látex quando comparadas às de silicone. Independentemente do tratamento térmico, todas as amostras revelaram a ausência de *S. mutans* e *C. albicans*. **Conclusão:** O tratamento térmico com microondas para as chupetas de silicone demonstrou ser o procedimento doméstico mais apropriado e eficiente para a desinfecção de chupetas.

Introduction

Studies demonstrated that the surface of a pacifier conceals microorganisms [5]. Niemala *et al.* (1994) [7] suggest that the pacifier would act as a way of transport by which pathogenic microorganisms could be disseminated among children and that the microorganisms can be hidden in the pacifier's pored surface. Sio *et al.* (1987) [9] reported significant differences in *C. albicans* colonization on pacifiers surface manufactured from latex and silicone.

Usually, hygiene and disinfections actions are necessary for the pacifiers. Boiling them in water is a common procedure widely used and recommended by manufacturers and health workers. More recently, the use of microwave energy to disinfections purposes is becoming a routine procedure [1, 4, 6] although it could alter the morphological structure of these materials. Microwave disinfections methods can result in morphological changes on surfaces treated and these modifications may facilitate microorganisms colonization, depending on the material used [1].

In this work, the possible morphological surface alterations on latex and silicone pacifiers when disinfected with boiled water or microwave energy were studied. Moreover, the elimination of *C. albicans* and *S. mutans* from pacifier surfaces disinfection procedure was also evaluated.

Material and methods

Forty orthodontic pacifiers fragments manufactured in latex (G1 e G3) and silicone (G2 e G4) were used and are described in table I. The microorganisms used in this study were strains of *S. mutans* (NTCC 1023) and *C. albicans* (ATCC 60193).

Table I - Groups of pacifiers and microorganisms

Microorganisms	Pacifier Material	
	Latex	Silicone
<i>Streptococcus mutans</i>	10 (G1)	10 (G2)
<i>Candida albicans</i>	10 (G3)	10 (G4)

S. mutans and *C. albicans* were individually inoculated corresponding to 10^6 CFU/mL in Brain Heart Infusion and Tryptic Soy Broth, respectively and incubated for 24 hours at 37°C. After pacifiers inoculation and incubation for 24 hours at 37°C with *S. mutans* and *C. albicans*, the contaminated samples were immediately prepared for Scanning Electron Microscope (SEM) and microbiological analysis (positive control).

The remaining contaminated fragments were submitted to thermal treatments for disinfection. They were boiled in water (at 100°C) during 5 and 10 minutes counted after the beginning of boiling or submitted to the microwave under maximum potency during 5 minutes, as used by Banting and Hill (2001) [1]. After thermal treatment, samples of each group were also analyzed by SEM and the others were submitted to vibration in a shaker for five minutes in saline solution. The saline solution containing *S. mutans* and *C. albicans* was then diluted, aliquots were inoculated in Bacitracina Sucrose Agar (SB₂₀) and Sabouraud Agar, respectively, and were incubated for 48 hours at 37°C and microorganisms growth were evaluated.

Results

SEM analyses revealed porosity, roughness and blisters to be present in the pacifier surface. After the disinfection procedure, all latex samples presented much more pores and roughness on its

surface than those samples without thermal treatment, outlining its damaging effect over this material (figure 1). On the other hand, silicone samples, whose surfaces were initially soft, presented only little blisters after thermal treatment of 10 minutes in boiled water or 5 minutes in microwave (figure 2).

The control group showed microorganisms colonies in every sample. The latex samples presented more *C. albicans* colonies, while for silicone *S. mutans* predominated the majority. The colony counter results obtained from those samples were submitted to culture media after disinfection procedure and it was verified that microorganism colonies could not be observed on any samples surface, revealing disinfection.

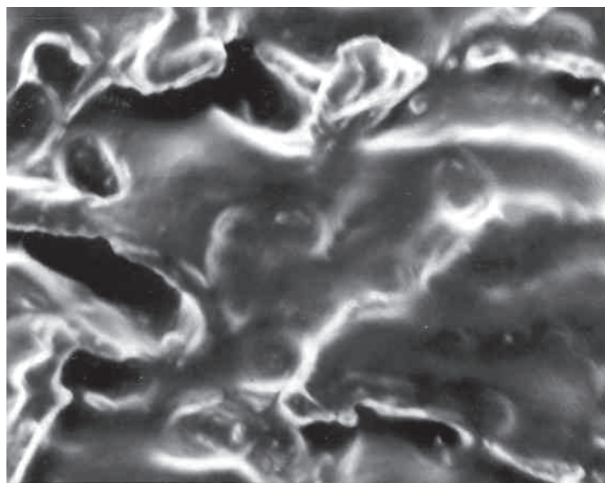


Figure 1 - Latex surface after 10 minutes in microwave

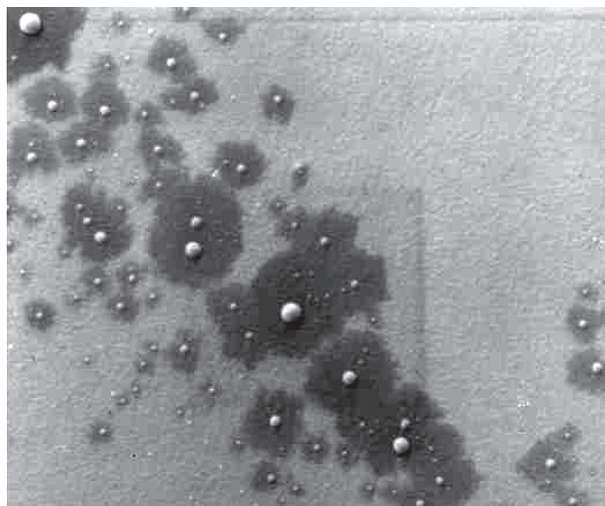


Figure 2 - Silicone surface after 10 minutes in microwave

Discussion

The differences observed on the surface of latex and silicone pacifiers before and after thermal treatments are in agreement with those reported by Sio *et al.* (1987) [9], who noticed no morphologic alterations on silicone pacifiers, while the latex material was strongly cracked, resulting in a higher or lower effect of microorganisms colonization on pacifier surface. Rubber latex shows, among other physical properties, melting point between 35.5°C and 40°C [2], what can explain the worsening of the original roughness observed in the not thermal treated samples. On the other hand, silicone rubbers are a mix of organic and inorganic compounds produced by polycondensation of silanol groups, and present exceptional heat resistance [8] as we could observe by the presence of only little blisters in the samples treated.

SEM and microbiological results after *S. mutans* and *C. albicans* cultivation demonstrated both microorganisms adhesion on latex and silicone pacifiers surface, with a presence of *C. albicans* adhesion could be observed in the amount of samples. Silicone pacifier is less sensible to thermal alterations although its surface can be colonized by *C. albicans* and predominantly by *S. mutans*. Our results are similar to Brook and Gober (1997) [3], that revealed anaerobics G+ and *Candida albicans* microorganisms in a huge amount. Therefore, effective and easy disinfections methods are necessary to save the oral children health.

Conclusion

Microwave disinfection is an optional and easy procedure, which can be used to eliminate or reduce the presence of pathogenic microorganisms that may persist on the pacifier surface. Five minutes of boiling water or microwave energy was sufficient to observe disinfection either on a silicone or latex pacifier surface.

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