Pacifier disinfection procedure: superficial morphological aspects and microorganisms colonization

Desinfecção de chupetas: aspectos morfológicos e colonização de microrganismos

Renata Cristiane da SILVA*
Denise Madalena Palomari SPOLIDORIO**
Ângela Cristina Cilense ZUANON***
Ricardo Henrique Moreton GODOI****

Correspondence:
Renata Cristiane da Silva
Rua Betari, 386 – Penha – São Paulo – SP – Brazil
CEP 03634-040
E-mail: re_cri@yahoo.com.br

* Ph.D. in Pediatric Dentistry – Araraquara Dental School – UNESP.
** Ph.D. in Pediatric Dentistry. Assistant professor, Araraquara Dental School – UNESP.
*** Ph.D. in Microbiology. Assistant professor, Araraquara Dental School – UNESP.
**** Ph.D. in Chemistry. Professor – Universidade Positivo.

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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.
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.

Palavras-chave: desinfecção; S. mutans; C. albicans; chupeta.

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

<table>
<thead>
<tr>
<th>Microorganisms</th>
<th>Pacifier Material</th>
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<tbody>
<tr>
<td>Streptococcus mutans</td>
<td>Latex</td>
</tr>
<tr>
<td>10 (G1)</td>
<td>10 (G2)</td>
</tr>
<tr>
<td>Candida albicans</td>
<td>10 (G3)</td>
</tr>
</tbody>
</table>

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.

**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.

**References**


