

The Antimicrobial Effect of Sodium Hypochlorite Agents for Intraoral Use



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Background

Oral microorganisms constitute a key role in the development of different intraoral infections including the two most common diseases dental caries and periodontitis. Different antimicrobials agents are often used in order to reduce the risk for developing any of these anchored infectious diseases. The most commonly used agent is chlorhexidine (CHX). It is known to have a strong antimicrobial effect, but may at the same time result in different side effects such as irritation of soft tissues and discoloration. Alternative agents have therefore been suggested.

Purpose

The aim of this work was to compare the effect of different sodium hypochlorite agents to other well known antimicrobial agents using the MIC and BMC techniques

Materials and method

The following eight substances were compared regarding their minimal inhibitory concentration (MIC) after 5 and 10 min using agar diffusion test (Ø disc 6 mm) and bactericidal minimum concentration (BMC): Perisolv gel, Carisolv gel, Perisolv liquid, NaOCl (component of Perisolv), amino acids (component of Perisolv), Dakin's solution, H₂O₂, and Chlorhexidine (CHX). The agents were tested against ten different oral microorganisms related to dental caries (C) or periodontitis (P). Tests were made in one and the same concentration (0.5%) and in the regular concentration of each substance. Two-way factorial using ANOVA was used to compare the different agents.

Results

For MIC, all irrigants except for H₂O₂ and the pure amino acids did show a clear antimicrobial effect (Table). The strongest effect was found for chlorhexidine. A similar effect was found for the chloramines when tested in the different formulas as the Perisolv gel, Perisolv liquid and the Carisolv gel (all 0.5% concentration). A similar picture was found when evaluating the products in their regular concentration (p<0.05/p<0.01). Analyses by the BMC (Figure) showed that a lower amount was needed for the Perisolv (x̄; 30.5 µg/ml agent/bacteria) than for Carisolv (x̄; 47.5 µg/ml agent/bacteria). Lower concentration was needed for the Perisolv product (0.7 µmol active chlorine) than for Carisolv (7.3 µmol active chlorine). The antimicrobial effect against tested microorganisms was more pronounced when using Perisolv compared to chlorhexidine (x̄; 41.0 µg/ml). A statistically significant effect when comparing the different agents was found (p<0.01). A more pronounced effect for tested microorganisms was also seen after the 10 min exposure time compared to 5 min.

Table. Minimal inhibitory concentration of 10 different bacterial strains related to caries (C) and periodontitis (P) at 10 min after exposure to the same concentration (0.5%) of the eight antimicrobial agents. Mean ± SD of duplicate tests. p-values for comparisons among bacteria are shown.

Agent Conc. (0.5%)	S. mutans (IB) (C)	S. mutans (OMZ) (C)	S. sobrinus (B13) (C)	Lactobacillus spp (C)	F. nucleatum (P)	P. intermedia (P)	P. nigrescens (P)	A. actinomycetem-comitans (P)	P. gingivalis (P)	S. salivarius (8618) (P)	Mean (ranking)	p-value
Perisolv gel	7.4 ± 0.8	7.0 ± 0.7	6.7 ± 0.2	6.7 ± 0.2	7.2 ± 0.8	7.5 ± 1.0	7.5 ± 1.5	7.1 ± 1.4	7.6 ± 1.3	6.8 ± 0.2	71.5 (5)	p=0.08
Perisolv liquid	7.0 ± 0	6.5 ± 0	6.5 ± 0	6.5 ± 0	6.5 ± 0	9.0 ± 2.5	9.0 ± 0	6.5 ± 0	6.5 ± 0	6.5 ± 0	70.5 (6)	p<0.05
Carisolv gel	9.8 ± 0.3	7.7 ± 0.8	6.7 ± 0.3	7.0 ± 0.7	6.5 ± 0	9.3 ± 0.3	7.5 ± 1.5	6.8 ± 0.8	10.5 ± 1.5	6.8 ± 0.3	78.6 (4)	p<0.01
NaOCl	8.5 ± 0.4	9.8 ± 1.3	9.0 ± 0.5	9.3 ± 0.9	13.5 ± 0.5	10.3 ± 0.8	13.5 ± 0.5	7.5 ± 0	9.3 ± 0.9	8.8 ± 0.6	99.5 (2)	p<0.01
Dakin's solution	9.3 ± 0.8	11.0 ± 0	9.5 ± 0	10.3 ± 0.3	9.0 ± 0.5	9.8 ± 0.3	9.5 ± 0	7.8 ± 0.6	9.2 ± 0.6	9.3 ± 0.2	94.7 (3)	p<0.07
Amino acids	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	60 (7)	ns
H ₂ O ₂	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	6.0 ± 0	60 (7)	ns
CHX	15.5 ± 0.4	15.8 ± 0.3	16.3 ± 0.3	14.0 ± 1.0	18.3 ± 1.3	20.7 ± 0.5	19.7 ± 0.5	16.5 ± 0.4	18.8 ± 0.8	12.8 ± 0.6	168.4 (1)	p<0.05

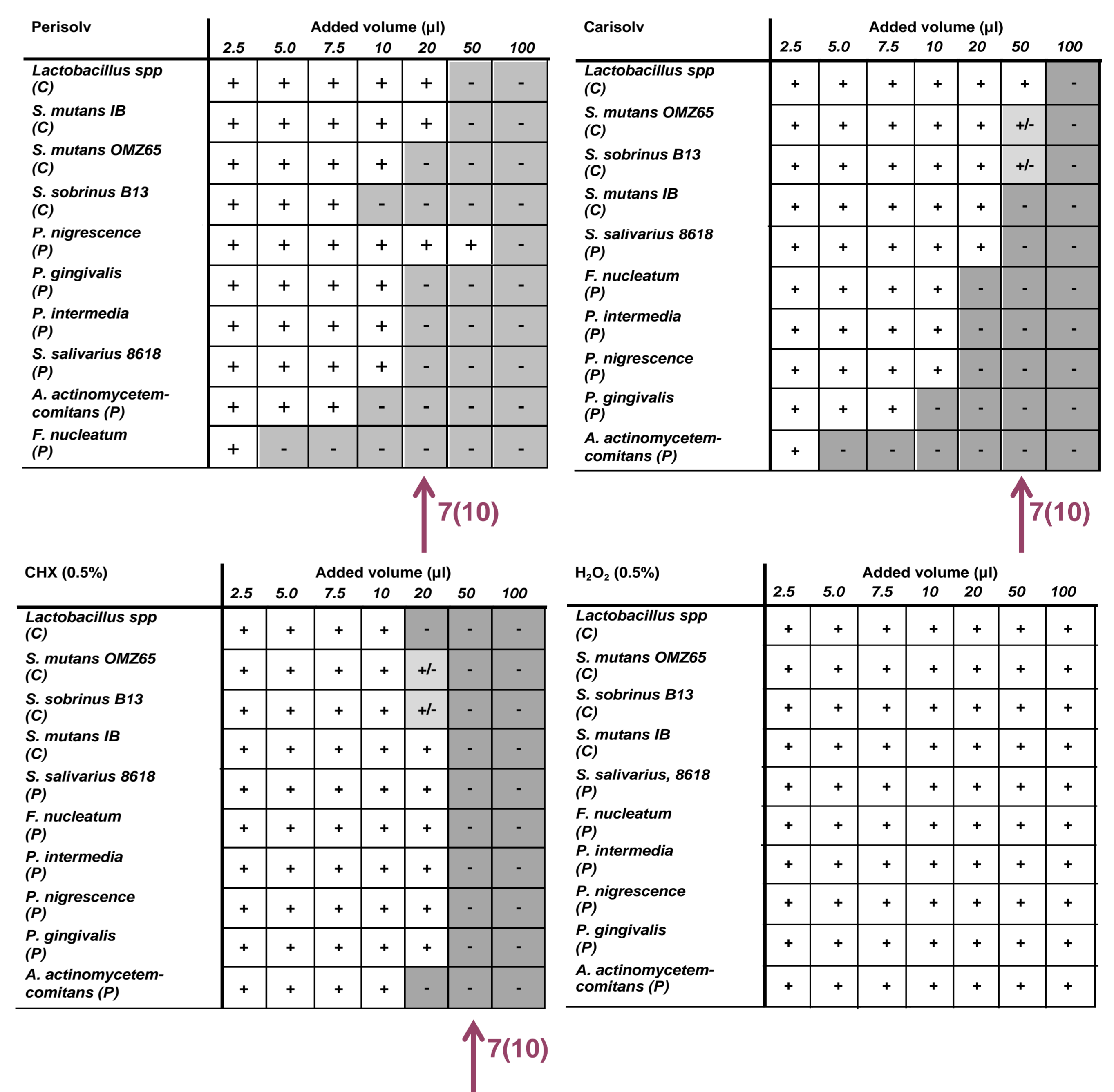


Figure. Bactericidal minimum concentration of different bacteria related to caries (C) or periodontitis (P) after 5 min of exposure for different agents holding the same concentration (0.5%). The arrows points at which volume 7 out of 10 bacteria were not able to be re-cultivated. Mean ± SD of duplicate tests.

Conclusions

The two sodium hypochlorite-containing solutions tested (Carisolv and Perisolv) showed a clear antimicrobial effect against caries- respectively periodontal-related microorganisms.

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