



## Disinfectant Efficacy of 0.525% Sodium Hypochlorite and Epimax on Alginate Impression Material

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### ABSTRACT

**Aim:** Species of *Streptococcus*, *Escherichia coli*, *Staphylococcus*, *Actinomyces*, *Pseudomonas*, *Klebsiella*, and *Candida* are commonly seen in the oral cavity. Impression materials are commonly contaminated with microorganisms. The present study was conducted to assess the disinfection efficacy of Epimax and 0.525% sodium hypochlorite on alginate impression over a period of 10 minutes.

**Materials and methods:** This study was conducted in the Department of Prosthodontics in the year 2015. An alginate impression material was prepared. For each bacteria species, 15 samples were used. Out of 15 samples, 3 were used by 0.525% sodium hypochlorite for disinfection for 5 minutes and 3 others for 10 minutes. Similarly, 3 samples were used by Epimax for 5 minutes and other 3 for 10 minutes. Three samples were used as controls. Each sample was polluted with *Candida albicans*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* strains.

**Results:** There was no statistical difference in *P. aeruginosa* and *C. albicans* after 5 minutes, whereas *S. aureus* showed significant difference ( $p < 0.05$ ). Epimax was found to be more effective in removing *S. aureus* as compared with other disinfectants.

Both Epimax and 0.525% sodium hypochlorite did not show significant difference against *P. aeruginosa* and *C. albicans*, whereas significant difference was found between both agents against *S. aureus* ( $p < 0.05$ ). It was seen that Epimax eliminated *S. aureus* after 5 minutes and *P. aeruginosa* after 10 minutes and 99.8% *C. albicans* after 10 minutes. About 0.525% sodium hypochlorite eliminated 99.1% of *C. albicans* after 10 minutes, whereas 98.5 and 99% of *S. aureus* and *P. aeruginosa* were eliminated after 10 minutes respectively.

**Conclusion:** Both Epimax and 0.525% sodium hypochlorite can disinfect the alginate impression material against *C. albicans*, *P. aeruginosa*, and *S. aureus* strains. However, Epimax was found to be more effective against *S. aureus* as compared with 0.525% sodium hypochlorite.

**Clinical significance:** Efficacy of disinfection of sodium hypochlorite and Epimax on alginate impression.

**Keywords:** Disinfectant, Sodium hypochlorite, *Staphylococcus aureus*.

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### INTRODUCTION

Pathogenic microorganisms can infect dental materials, such as alginate and putty. It has been observed that most of the organisms affect impression trays, impression materials, and so forth. Even dentists are affected by different pathogens during handling of dental products. Thus, infection from patients can reach the dentist through poured stone cast and alginate impression.<sup>1</sup>

Among various bacteria, species of *Streptococcus*, *E. coli*, *Staphylococcus*, *Actinomyces*, *Pseudomonas*, *Klebsiella*, and *Candida* species are commonly seen. Impression materials are commonly contaminated with microorganisms. Hence, dental material disinfection is of paramount

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importance in reducing transmission of infection from patient to dentist as well as to laboratories.<sup>2</sup>

According to the International Dental Federation, all the impressions should be disinfected before sending to laboratories. Similarly, the American Dental Association recommended the disinfection of patients' impression trays. Few dentists use water to remove bacteria from the impression materials. The British Dental Association in its advice sheet A12 recommended disinfection and decontamination of dental impressions.<sup>3</sup>

Studies have proved the efficacy of tap water between 50 and 90% in eliminating microorganisms. Most of the dentists prefer phenols, alcohols, chlorine combination, aldehydes, biguanides, iodide, etc., as disinfecting agents. Immersion and spraying are two commonly used methods to disinfect dental materials. Chemical disinfection can be performed by removing blood and saliva with brush and water rinsing. It has been observed that spraying does not eliminate microorganisms from undercuts while immersion is very effective in disinfecting all surfaces. Immersion technique minimizes the risks of incomplete coverage and disinfectant inhalation hazards.<sup>4</sup>

Rueggeberg et al<sup>5</sup> in their study found no difference in dimensional changes in poured stone casts when alginate impression was disinfected with spray compared with water-rinsed controls. They observed that immersion causes dimensional distortion. However, decrease in surface details was found to the same extent in both groups. There was similar antimicrobial efficacy in both methods while just water rinsing did not show much disinfected effect. This study was conducted to assess the disinfection potential of Epimax and 0.525% sodium hypochlorite on alginate impression material in 10 minutes.

## MATERIALS AND METHODS

This study was conducted in the Department of Prosthodontics in the year 2015. This was an *in vitro* study. An alginate impression material was prepared by adding water in a bowl and poured in 5 cc syringe. The impression material was cut off and multiple alginate samples were prepared. For each bacteria species, 15 samples were used. Out of 15 samples, 3 were used by 0.525% sodium hypochlorite for disinfection for 5 minutes and 3 others for 10 minutes. Similarly, 3 samples were used by Epimax for 5 minutes and other 3 for 10 minutes. Three samples were used as controls.

Each sample was polluted with strains of *C. albicans*, *P. aeruginosa*, and *S. aureus*; 0.525% sodium hypochlorite and Epimax were used on each sample as 10 puffs in 15 seconds. Later samples were poured into sterile plastic bags having humidified cotton to form a moisturized

environment for 5 and 10 minutes. Samples were kept in 2% trypsin for 1 hour after washing them with distilled water for 30 seconds. Samples were transferred to Mueller–Hinton agar for *S. aureus* and *P. aeruginosa*; and for the detection of *C. albicans*, Sabouraud dextrose agar (SDA) medium was used. The growth on culture was counted 24 and 48 hours after incubation. Bacterial colonies were counted after 24 and 48 hours, and after 72 hours *C. albicans* colonies were counted on SDA. Results thus obtained were subjected to statistical analysis for correct inferences;  $p < 0.05$  was considered significant.

## RESULTS

Table 1 shows the disinfected effect of various agents against *C. albicans*, *P. aeruginosa*, and *S. aureus*. There was no statistical difference in *P. aeruginosa* and *C. albicans* after 5 minutes, whereas *S. aureus* showed significant difference ( $p < 0.05$ ). Epimax was found to be more effective in removing *S. aureus* as compared with other disinfectants. Table 2 shows the disinfectant efficacy of both Epimax and 0.525% sodium hypochlorite after 10 minutes against *C. albicans*, *P. aeruginosa*, and *S. aureus*. Both Epimax and 0.525% sodium hypochlorite did not show significant difference against *P. aeruginosa* and *C. albicans*, whereas significant difference was found between both agents against *S. aureus* ( $p < 0.05$ ).

Table 3 shows the percentage disinfectant efficiency of Epimax and 0.525% sodium hypochlorite after 5 and 10 minutes against *S. aureus*, *P. aeruginosa*, and *C. albicans*. It was seen that Epimax eliminated *S. aureus* after 5 minutes and *P. aeruginosa* after 10 minutes and 99.8% *C. albicans* after 10 minutes. About 0.525% sodium hypochlorite eliminated 99.1% of *C. albicans* after 10 minutes, whereas 98.5 and 99% of *S. aureus* and *P. aeruginosa* were eliminated after 10 minutes respectively.

## DISCUSSION

Dentist and dental materials encounter microorganisms frequently in daily life. Impression taken from patient's

**Table 1:** Disinfected agents and control group in 5 minutes

Disinfected	<i>S. aureus</i>	<i>P. aeruginosa</i>	<i>C. albicans</i>
0.525% sodium hypochlorite–control	0.02	0.42	0.2
Epimax–control	0.01	0.21	0.08
0.525% sodium hypochlorite–Epimax	0.03	0.07	0.062

**Table 2:** Disinfected agents and control group in 10 minutes

Disinfected	<i>S. aureus</i>	<i>P. aeruginosa</i>	<i>C. albicans</i>
0.525% sodium hypochlorite–control	0.031	0.41	0.21
Epimax–control	0.001	0.22	0.07
0.525% sodium hypochlorite–Epimax	0.04	0.06	0.08

**Table 3:** Bacterial growth prevention in 5 and 10 minutes

Disinfected	Time (minutes)	S. aureus (%)	P. aeruginosa (%)	C. albicans (%)
0.525% sodium hypochlorite	5	97.2	98.1	98.2
	10	98.5	99	99.1
Epimax	5	100	99.4	98.2
	10	100	100	99.8

mouth is contaminated with microbial flora. Most commonly seen microorganisms are *S. aureus*, *P. aeruginosa*, and *C. albicans*.

*Staphylococcus aureus* is a Gram-positive, round-shaped bacterium and is frequently found in the nose, respiratory tract, and on the skin. *Staphylococcus aureus* is part of the normal commensalism present in the upper respiratory tract of humans.<sup>6</sup>

*Candida albicans* is a yeast, i.e., seen in human gut flora. It is detected in the gastrointestinal tract and mouth in 40 to 60% of healthy adults. It causes candidiasis which is a common fungal infection of the oral cavity. It is source of infection for dentists.<sup>7</sup>

*Pseudomonas aeruginosa* is a rod-shaped Gram-negative common bacteria that can cause disease in humans. It can cause opportunistic infection and also infects the impression material, such as alginate. This study was conducted to assess the disinfection potential of Epimax and 0.525% sodium hypochlorite on alginate impression material in 5 and 10 minutes.<sup>8</sup>

We found that Epimax is equally effective in eliminating *S. aureus* compared with 0.525% sodium hypochlorite. Our results are in agreement with those of Al-Jabrah et al.<sup>9</sup> We compared both Epimax and 0.525% sodium hypochlorite after 10 minutes against *C. albicans*, *P. aeruginosa*, and *S. aureus*. In our study, both Epimax and 0.525% sodium hypochlorite did not show significant difference against *P. aeruginosa* and *C. albicans*, whereas significant difference was found between both agents against *S. aureus* ( $p < 0.05$ ). Our results are in contrast to Rueggeberg et al<sup>5</sup> who observed that impression materials can be effectively disinfected with sodium hypochlorite 0.525% spray.

We compared the percentage disinfectant efficiency of Epimax and 0.525% sodium hypochlorite after 5 and 10 minutes against *C. albicans*, *P. aeruginosa*, and *S. aureus*. It was seen that Epimax eliminated *S. aureus* after 5 minutes and *P. aeruginosa* after 10 minutes and 99.8% *C. albicans* after 10 minutes. About 0.525% sodium hypochlorite eliminated 99.1% of *C. albicans* after 10 minutes, whereas 98.5 and 99% of *S. aureus* and *P. aeruginosa* were eliminated after 10 minutes respectively. Whereas, in Westerholm et al<sup>10</sup> study, it was observed that growth of *S. aureus* can be prevented (99.99%) with sodium hypochlorite.

Badrian et al<sup>11</sup> compared three disinfectants for sterilization of alginate impression materials, such as sodium hypochlorite 0.525%, Deconex, and Epimax. They found that Epimax is more effective among all disinfectants tested. Hiraguchi et al<sup>12</sup> concluded that larger dimensional changes of three brands of alginate impression occur after immersion method. Rad et al<sup>13</sup> suggested spraying with sodium hypochlorite or glutaraldehyde than immersion method. Hasanah et al<sup>14</sup> observed no changes in dimension of alginate after spraying with *Piper betle* L over 80% solution. Amalan et al<sup>15</sup> found that addition of chlorhexidine not only helps in disinfection of alginate but also eliminates the disinfection step. The present study indicates that both sodium hypochlorite and Epimax are effective in disinfecting the alginate impression material.

## CONCLUSION

Both Epimax and 0.525% sodium hypochlorite can disinfect the alginate impression material against *C. albicans*, *P. aeruginosa*, and *S. aureus*. However, Epimax was found to be more effective against *S. aureus* as compared with 0.525% sodium hypochlorite.

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