# Efficacy of three Disinfectants on Alginate Impressions

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**Abstract**

**Background and Purpose:** Dental impressions often carry microorganisms that may cause cross infection from patients to dental staff. The purpose of this study was to evaluate the disinfecting efficacy of three commercially available disinfectants on Staphylococcus aureus.

**Methods and subjects:** Impressions were made of a sterile metal model of the maxillary arch that had been contaminated with Staphylococcus aureus. The Impressions were cultured before and after immersion in one of the following disinfectants: 15 minutes in Micro $10^{+}$ (5%), 5 minutes in Deconex (2%) and 10 minutes Glutaraldehyde (2%).

**Results:** Kruskal-Wallis test was used to evaluate the colony forming units (CFUs) of Staphylococcus Aureus.in each of the three groups. The same test showed that the colony forming units (CFUs) were reduced to Zero by all disinfectants.

**Conclusion:** This study showed that all disinfectants were fully successful in complete removal of Staphylococcus Aureus.

**Keywords:** Alginate, Disinfectant, Impression, Glutaraldehyde, Deconex, Micro $10^{+}$

Dental practitioners should have a precise program to prevent or reduce the risk of any disease transmission. Dental impressions play an important role in transmission of infectious diseases.[1, 2] In other words, Dental impressions brought into the laboratory can be contaminated with bacteria, viruses, and fungi.[3, 4]

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Therefore, they should be thoroughly cleaned and disinfected. Preventing cross contamination between patients and/or patients and health care providers is the principal aim of disinfection; therefore, current recommendations are that the dental impressions should be disinfected prior to being transferred to laboratory. The best time to clean and disinfect impressions is immediately after removal from the patient's mouth before drying of blood or other bioburden can occur.[5] It also should be ensured that appropriate cleaning and disinfection procedures are performed in the dental office or laboratory, therefore, choice of disinfectant can be of great importance in order to ensure effective disinfection procedure. Numerous microorganisms live in human saliva; one of these microorganisms, which is the most common cause of staph infection, is Staphylococcus aureus (S. aureus). About 20% of the population are long-term carriers of this microorganism.[6] S. aureus can cause a range of illnesses from minor skin infections, such as pimples and boils, to life-threatening diseases

such as pneumonia, meningitis, and osteomyelitis; this microorganism is also widely used to evaluate the effectiveness of disinfectants.[7,8] The aim of this study was to compare the effectiveness of three commercially available disinfectants in authors' region namely, Glutaraldehyde, Deconex, and Micro $10^{+}$ on S. aureus on dental impressions.

**Materials and Methods**

In this study a metal mould of maxilla was fabricated. This mould was placed in an autoclave for sterilization. Afterwards, the mould was rinsed in a microbial suspension infested with S. aureus ($5^{10}$ bacteria/mL) for 20 seconds. (Figure 1) 30 Alginate impressions were taken from the metal mould.

**Figure 1: Rinsing the mould in a microbial suspension infested with S. aureus**

The impressions were then rinsed slowly for 15 seconds with 250 cc of sterile water in accordance with ADA recommendations.9 After shaking off excess water, samples were taken from occlusal surface of upper right and left first molars by a sterilized swab. The samples were cultured in a laboratory. These cultures were plated on to Mannitol Salt Phenol-red Agar (Becton-Dickinson-MD21030) and incubated at 37° C for 48 hours. (Figure 2) S. aureus was then counted manually in the cultures.

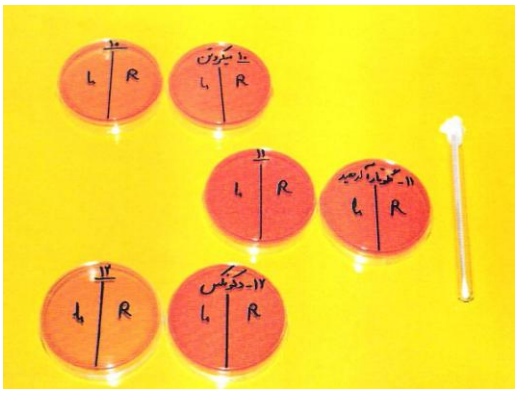

**Figure 2: Placing the cultures on Mannitol Salt Phenol-red Agar**

Afterwards, all the alginate impressions were randomly rinsed in three disinfectants as recommended by their manufacturers. (Figure 3)

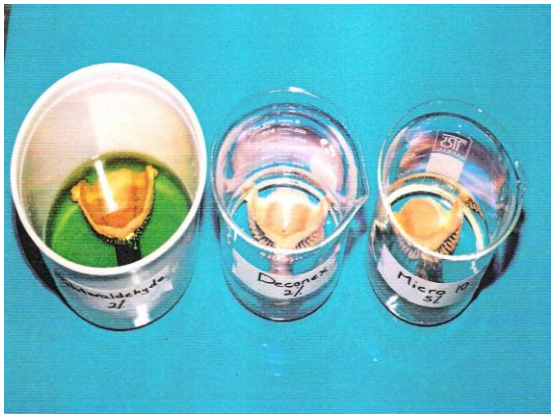

**Figure 3: The alginate impressions were randomly rinsed in three disinfectants**

Ten impressions were rinsed in Glutaraldehyde (Behsa Gluteral 2%, batch no: 5980b96) for 10 minutes. Ten other impressions were rinsed in Deconex (Borer Chemie AG 2%, LOT: 141998) for 5 minutes; and the last ten impressions were rinsed in Micro $10^{+}$ (Unident 5%, batch No: 5154M11) for 15 minutes. After this process all impressions were removed from solutions and were rinsed in 250 cc of sterilized water for 15 seconds. Samples were taken from occlusal surface of upper right and left second molars by a sterilized swab. (Figure 4)

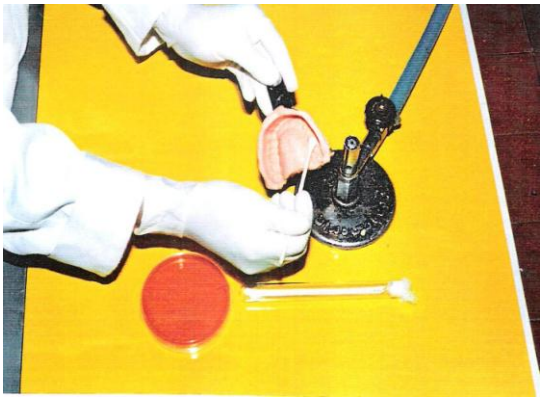

**Figure 4: Samples were taken from occlusal surface of upper right and left second molars by a sterilized swab**

These samples were also cultured in the same lab and under the same conditions and S. aureus was counted after having been placed in same incubator for 48 hours. Kruskal-Wallis test was used to evaluate the colony forming units (CFUs) of S. aureus in each of the three groups including ten samples. Mann-Whitney U test was used to evaluate the level of S. aureus before and after disinfection.

**Results**

The colony forming units (CFUs) before disinfection was 803.3±967.4, 1150±1298.8, and 956±1299.7 in Micro $10^{+}$, Deconex, and Glutaraldehyde groups respectively. Kruskal-Wallis test showed no statistically significant difference among the CFUs of these groups ($P<0.7$).

Contamination of all three groups became zero after disinfection. Man-Whitney U test showed a statistically significant difference between pre and post disinfection in CFUs of each of the three groups ($P<0.0001$) (Table 1)

| Disinfectant | Contact time (min) | Pre | Post |
|---|---|---|---|
| Micro $10^{+}$ | 15 | 803.3 ± 967.4 | 0.00 |
| Deconex | 5 | 1.50 ± 1298.8 | 0.00 |
| Glutaraldehyde | 10 | 956 ± 1299.7 | 0.00 |

**Table 1: Pre- and Post-disinfection Colony Forming Unit (CFU) Counts for S. Aureus**

**Discussion**

This study showed that all three disinfectants of Micro $10^+$ , Deconex, and Glutaraldehyde had the same effect on S. aureus. Micro $10^+$ (5%) reduced the level of S. aureus to zero in 15 minutes. Similarly Deconex (2%) and Glutaraldehyde (2%) reduced the CFUs of S. aureus to zero in 5 and 10 minutes, respectively.

Dental impressions are potential sources for cross-contamination and should be disinfected in a manner to prevent any transmission of infectious diseases to dental health care provider, patients and other people involved. Effective communication and coordination between the laboratory and dental practice will ensure that appropriate cleaning and disinfection procedures are performed in the dental office or laboratory.

Dental impressions brought into the laboratory can be contaminated with bacteria, viruses, and fungi.[3,4] Therefore, they should be thoroughly cleaned and disinfected as soon as removed from patient's mouth. Bringing untreated items into the laboratory increases chances for cross infection.[10] Transfer of oral microorganisms into and onto impressions has been documented. [11, 12] Impressions which become frequently contaminated should be cleaned and disinfected according to instructions of disinfectants' manufacturer. In this study the authors tried to check the validity of instructions of three disinfectants namely: Micro $10^+$ (5%), Deconex (2%) and Glutaraldehyde (2%).

The antimicrobial efficacy of alginate impressions mixed with an antimicrobial solution has been established by other authors.13 Casemiro et al.[14] also compared the effect of 0.2% digluconate chlorhexidine solution with an antimicrobial agent in powder. McNeil et al. compared the cleaning efficacy of three disinfection methods in removing Streptococcus Sanguis or poliovirus from the impression material. They found that all three methods of chemical disinfectants including 2% Glutaraldehyde, 10% Hypochlorite, and Hygojet cycle completely removed all detectable bacteria from the impression.[11] Schwartz et al.[7] also evaluated the effectiveness of four disinfectants on impressions. The microorganism selected for this study is widely used to evaluate the effectiveness of disinfectants.[7, 8]

**Conclusions**

Impressions were contaminated using microorganisms cultures and then they were disinfected using three different disinfectants. In each instance the disinfectants used under recommended instructions were 100% successful in removing bacteria from the surface of the impressions.

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