Antimicrobial Activity of Chlorhexidine Gluconate 0.05% on Bacterial Contamination in Dental Unit Water Lines

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Abstract
Most general practice dental unit water lines have been as a source for potential infection, consequently most water used during routine dental procedures has bacterial contamination above level considered acceptable for safe drinking water. The use of anti microbial agent to eliminate microorganism causing infections diseases has been discussed for a number of years. One agent of anti microbial widely used to reduce the bacterial load in the mouth is Chlorhexidine.

Objectives:
The aim of the study was to determine the sensitivity of Chlorhexidine gluconate 0.05% on bacterial load on Dental Unit Water Lines.

Methods: Chlorhexidine gluconate 0.05% as known CHX solution was examined in vitro to inhibit the bacterial growth by determining the inhibition zone (agar diffusion method). The bacterial microorganisms tested were bacterial load isolated from Dental Unit Water Lines in Public Dental Services. Pseudomonas aeruginosa, Staphylococcus aureus, Fusobacterium spp, Diptheroid spp Propionibacterium, Micrococcus, Streptococcus spp. Data obtained was done in a descriptive.

Results: showed CHX solution was the most effective against Pseudomonas aeruginosa (inhibition zone 2.20 mm); Staphylococcus aureus (inhibition zone 4.30 mm), Fusobacterium spp (inhibition zone 4.50 mm), Diptheroid spp (inhibition zone 2.80 mm) Propionibacterium (inhibition zone 3.00 mm), Micrococcus spp (inhibition zone 3.90 mm), Streptococcus spp (inhibition zone 2.50 mm). The separated test was samples were taken from untreated Dental Unit System, samples were plate in blood agar medium and incubated in anaerobic chamber for 72 hours. Colony Forming Units found was > 60.000 CFU/ml.

Conclusion: we concluded that Chlorhexidine gluconate 0.05% has anti microbial activity against bacterial load isolated from Dental Unit Water Line. It is suggested to disinfects the Dental Unit Water Lines with CHX 0.05% routinely.

Key words: CHX – Bacterial contamination

Introduction
Most general practice dental unit water lines have been as a source for potential infection, consequently most water used during routine dental procedures has bacterial contamination above level considered acceptable for safe drinking water.

Therefore a hygiene concept should be developed and disinfected on dental unit water lines with high concentrated disinfectants should be recommended.

In recently study that CHX 0.05% is one of the medicine which can be used to a topical manner on the outer tissue of the body, and healing process speed of a wound against bacteria contained in wound in primary school children.1

In this study is still needed further research to determine antimicrobial of CHX 0.05% in controlling bacterial contamination dental unit water lines. It needs to be done so the community as the consumers can feel safely while they are on the treatment in dentistry.

The objective of this research is determining the sensitivity of CHX 0.05% by measuring the inhibitory zone bacteria isolated from dental unit water lines harboring species in Public Dental services.
The research result will provide information about CHX 0.05% and its effectiveness in surveillance on bacterial contamination in dental unit water lines system in dentistry in particular and for researcher in general.

**Material and Methods**

The material is used in this research is *Chlorhexidine gluconate 0.05%* chemically it consists of 1.6-bis-p chlorophenylbiguanidohexane. It is known as antiseptic solution. The bacteria used as analysis unit are bacteria isolated from dental unit water lines: *Pseudomonas aeruginosa, Staphylococcus aureus, Fusobacterium spp, Diptheroid spp Propionibacterium, Micrococcus, Streptococcus spp.*

The bacteria are cultivated with Brain Heart Infusion Broth (BHI), Blood agar media and Diagnostic Sensitivity Test (DST) was performed. Those specimen are incubated in anaerobic chamber at 37 Celsius degree for 3 X 24 hours.

Sensitivity test to antibiotic can be done by using disk with drug in solid media. Sensitivity test of bacteria to CHX 0.05%

Diluted 1 ml of *Pseudomonas aeruginosa, Staphylococcus aureus, Fusobacterium spp, Diptheroid spp Propionibacterium, Micrococcus, Streptococcus spp.* In the agar of DST petri disc, the bacteria suspended wet the DST agar thoroughly.

Put CHX 0.05% on a disc and put it on the surface of DST agar. Those petri discs are incubated in anaerobic chamber at 37 Celsius degree for 3 X 24 hours.

After 72 hours, macroscopically we can see the Inhibition zone will show around the disc and measuring the diameter of the isolated zone around the samples.

Data obtained was analysis in a descriptive method.

**Results**

The results of sensitivity test of *Pseudomonas aeruginosa, Staphylococcus aureus, Fusobacterium spp, Diptheroid spp Propionibacterium, Micrococcus, Streptococcus spp* to CHX 0.05% can be seen on table 1.

The measurement of inhibition zone which is carried out from the border of disc to zone with bacterial growth showed that inhibitory zone of *Pseudomonas aeruginosa* is 2.20 mm; 4.30 mm for *Staphylococcus aureus*; 3.00 mm for *Fusobacterium spp*; 2.80 mm for *Diptheroid spp*; 3.00 mm for *Propionibacterium*; 3.90 mm for *Micrococcus* and 2.50 mm for *Streptococcus spp*.

<table>
<thead>
<tr>
<th>Type of Bacteria</th>
<th>Inhibitory zone (mm)</th>
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</thead>
<tbody>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>2.20</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>4.30</td>
</tr>
<tr>
<td><em>Fusobacterium spp</em></td>
<td>3.00</td>
</tr>
<tr>
<td><em>Diptheroid spp</em></td>
<td>2.80</td>
</tr>
<tr>
<td><em>Propionibacterium</em></td>
<td>3.00</td>
</tr>
<tr>
<td><em>Micrococcus</em></td>
<td>3.90</td>
</tr>
<tr>
<td><em>Streptococcus spp</em></td>
<td>2.50</td>
</tr>
</tbody>
</table>
The separated test was samples were taken from untreated Dental Unit System , samples were plated in blood agar medium and incubated in anaerobic chamber for 72 hours. Colony Forming Units found was > 60,000 CFU/ml.

Discussion

From the results showed that all of bacteria’s contaminants on dental unit water lines are sensitive to Chlorhexidine gluconate 0.05%.

Inhibitory zone of *Pseudomonas aeruginosa* is 2.20 mm; 4.30 mm for *Staphylococcus aureus*; 3.00 mm for *Fusobacterium spp*; 2.80 mm for *Diptheroid spp*; 3.00 mm for *Propionibacterium*; 3.90 mm for *Micrococcus* and 2.50 mm for *Streptococcus spp*.

The separated test was samples were taken from untreated Dental Unit System, samples were plated in blood agar medium and incubated in anaerobic chamber for 72 hours. Colony Forming Units found was > 60,000 CFU/ml. 

Those bacteria are a research parameter because the bacteria are found in nature, thereby causing infection to be contaminated by these bacteria.

In the past study it had been proven that CHX 0.05% can inhibit the growth of *Pseudomonas aeruginosa* and other bacteria found on the vulnus laceratum.

Sterilization with CHX solution 0.05% can inhibit the growth of bacteria of the normal flora in the skin.

Chlorhexidine gluconate 0.05% chemically it consists of 1.6-bis-p-chlorophenylbiguanidohexane. It has a broad antimicrobial spectrum and generally more effective against gram-positive than against gram-negative bacteria. It is inactive against bacterial spores at room temperature. CHX inhibits some viruses and is active against some fungi. CHX is bactericidal and act as detergent by damaging the cell membrane.

One agent of antimicrobial widely used to reduced salivary level of mutans streptococci, caries activity levels of mutans streptococci in plaque, and salivary level of mutans streptococci in orthodontic patients.

Conclusion and Suggestion

The results showed that Chlorhexidine gluconate 0.05% has bacterial activity against *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Fusobacterium spp*, *Diptheroid spp*, *Propionibacterium*, *Micrococcus*, *Streptococcus spp* in vitro.

It is suggested to disinfects the Dental Unit Water Lines system with CHX 0.05% routinely.

Acknowledgement

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