THE EFFECT OF SORBITOL - CONTAINING CANDY ON CARIES ACTIVITY LEVELS OF MUTANS STREPTOCOCCI IN PLAQUE
(Analysis of the effectiveness for a period 1 month consumption)

Soherwin Mangundjaja *, Titi Pratiwi ** and Heriandi Sutadi**
*Department of Oral biology and **Department of Pediatric Dentistry
Faculty of Dentistry Universitas Indonesia

ABSTRACT
Dental caries on population presents a tremendous challenge to the dental profession in population. In the attempt to lower the sugar consumption in population is to exchange the number of sugar sweeteners which manufacture produced for used in foods, drinks and candy with non-sugar sweetener as sorbitol. Sorbitol is effective as non cariogenic substitutes for use in place of glucose. Objectives: Clinical trial was carried out to investigate the effect of sugar-candy containing sorbitol on caries activity levels of mutans streptococci in plaque for a period 1 month consumption. Method: Twenty respondents participated as the subjects on the clinical trial, conducting two times of treatment as follows: twenty as treatment group, before and after consuming sorbitol-containing candy, and twenty subjects as control group, before and after consuming sucrose-containing candy. Plaque samples were taken from small discrete areas of buccal tooth surfaces with the tip of sterile toothpick then the tips were cut off and put directly in a small tube of Cariostat were incubated in Gas-pack jar for 3 days at 37°C Celsius degree. Data which were obtained from Cariostat were analyzed using percentages based on grades changing pH of Cariostat. Results: showed that there is no significance of caries activity levels of mutans streptococci in plaque between before and after consuming sucrose-containing candy. However, a significant difference was found respectively as results of before and after consuming sorbitol-containing candy. Conclusion: Therefore it could be concluded that sorbitol-containing candy is effective in inhibiting caries activity levels of mutans streptococci in plaque.

Key words : Soritol - Caries Activity- Mutans Streptococci-Plaque
INTRODUCTION

The Directorate of Health Ministry of Oral Health Republic of Indonesia declared that 60-80% of population was suffering from dental caries. Dental caries on population presents a tremendous challenge to the dental profession in population. Manufactures produced the number of sugar sweeteners that are approved for used in foods, drinks and candy.

These sugar sweeteners are generally classed as cariogenic. It is known that consumption of sugar sweeteners play a role in developmental of caries.

Streptococcus mutans has long been associated with dental caries in man and the ability of Streptococcus mutans to form plaque on its ability to synthesize extra cellular polysaccharides from sucrose. Sucrose could be fermented by Mutans streptococci which harbored in the dental plaque and acid production of mutans streptococci could possibly lead to demineralization of the teeth.

In epidemiological study, the presence Streptococcus mutans is associated with high number of salivary mutans streptococci (Soeherwin Mangundjaja, 1993) and caries activity of mutans streptococci in high caries prevalence (Soeherwin I'vlangoendjaja, Abdul Muthalib and Ariadna Djais, 1995). Caries activity of mutans streptococci determined by using colorimetric all may show some discrepancies, but this colorimeter (Cariostat of Tzu Shimono, 1986) showed correlation with the ability of mutans streptococci produced acid in the plaque.

In this study using sorbitol-containing candy as non-sugar sweetener had the effect of reducing the rate of acid production, compared with glucose as sugar sweetener which is add-sensitive to mutans streptococci to persist in greater number.

OBJECTIVE

To examine the effect of non-sugar sweeteners and sugar sweeteners on caries activity of mutans streptococci in plaque for a period 1 month consumption.

MATERIAL AND METHODS

This study using Frozz-Nimms as sorbitol-containing candy and sucrose containing candy as control. The analyzed unit was Streptococcus mutans in plaque.

Semi-synthetic liquid medium consisting of 20 % sucrose, RC.G, RCP, Na,NJ,NaCL and Tryptose was selected as a colorimetric method (Carisostat) for determining caries activity of mutans streptococci in plaque.
Vial of 2 ml semi-synthetic liquid -containing plaque samples were incubated in Gas-pack (Baltimore Biological Laboratories, Cockeysville, Mass) jars for 3 days at 370 Celsius degree.

Twenty respondents were participated as a research subject: 20 subjects treated two times with Frozz-Nimms- sorbitol-containing candy and with Sucrose containing candy as control group. Collecting samples as follows:

1. Plaque samples were taken from small discrete areas of buccal tooth surfaces with the tip of sterile toothpick then the tips were cut off and put directly in a small tube of Cariostat. Then tubes - containing Cariostat ,were incubated in Gas-pack jar for 3 days at 370 Celsius degree.
2. Respondents were treated with Frozz sorbitol-containing candy and Sucrose -containing candy, 3 X 3 candies daily for a period of one month consumption.
3. Everyone week consumption of Sorbitol-containing candy and Sucrose containing candy is then plaque samples were taken and the bacteriological procedures is the same as stated in item No 1 above.
4. At the fifth week consumption of Sorbitol-containing candy and Sucrose containing candy is then plaque samples were taken and the bacteriological procedures is the same as stated in item No 1 above.
5. Mutans streptococci activity determined by Cariostat. After incubating of cariostat -containing plaque samples the color of the test tubes will change and comparing with the control sample with standard test liquid for color sample use preliminary prepared by changing pH. Estimating by making classification into 4 grade:
   Grade 0 = - blue pH 7.3 Grade 0 = + green pH 5.2.
   Grade 2 = ++ yellow-green pH 4.7 . Grade 3 = +++ yellow pH 4.0

Analysis

Data were analyzed using percentages based on grades changing pH of Cariostat.
RESULTS

Table 1. Caries activity of mutans streptococci in plaque after consuming Sucrose containing candy for a period of one month consumption

<table>
<thead>
<tr>
<th>Sucrose Grade</th>
<th>Before Treatment 0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>After treatment 0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4th week 0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>No of activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>62</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td></td>
<td>16</td>
<td>62</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td></td>
<td>4</td>
<td>22</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

Results showed that caries activity levels of mutans streptococci in plaque there is no significance activity among the subjects between before and after consuming sucrose-containing candy. Caries activity has grade 1 pH 5.2 (12.5 % ), Grade 2 pH 4.7 (65 %) and grade 3 pH 4.0 (22.5 %)

Table 2. Caries activity of mutans streptococci in plaque after consuming Frozz Nimms Sorbitol-containing candy for a period of one month consumption

<table>
<thead>
<tr>
<th>Frozz Grade</th>
<th>Before Treatment 0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>After treatment 0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4th week 0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>No of activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>4</td>
<td>6</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>26</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>6</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>10</td>
<td>8</td>
<td>6</td>
<td>4</td>
<td></td>
<td>10</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

Results showed that caries activity of mutans streptococci in plaque between before and after consuming Frozz-Nimms-sorbitol containing candy reduced at the 3rd week. Caries activity has grade 0 pH 7.3 (35 %), grade 1 pH 5.2 (12.5 %), grade 2 pH 4.7 (35 %) and grade 3 pH 4.0 (17.5 %)

DISCUSSION

The results shown in table 2 the percentage of caries activity of mutans streptococci in plaque after consuming Frozz Nimms-sorbitol containing candy for a period 3 weeks showed decreased while at the same time on the 4th week increased.
In this study sorbitol had the effect of reducing the rate acid production on the 3rd weeks compared with sucrose enabling acid sensitive to persist in greater number of caries activity.

It is known in table 1 caries activity before and after consuming sucrose containing candy during one month that activity reached a level below the critical pH around 5.5 (Stephan, RM 1940) - i.e. a level at which the enamel is demineralized.

Twenty respondents have been used sorbitol-containing candy 3 X 3 tablet daily for a period of 3 weeks was not found to reach a level below critical pH around 5.5. It is known that non-sugar sweetener is sorbitol is classed as non-cariogenic., because sorbitol is not fermented by mutans streptococci and considered leading to a reduced both the growth rate and the acid production. It ran possibly lead to reduce levels of mutans streptococci in plaque.

Some researchers stated that sorbitol is able to reduce the number of mutans streptococci in the oral cavity is still debated , some study results have shown reduction and others have not (Bratthall, 1998)\(^5\).* The present study sorbitol is not able fermented by the mutans streptococci for only a period 3 weeks consumption, next of 4th week increased numbers of activity.

Therefore sorbitol which some studies to some extent can be fermented by mutans streptococci and some studies have demonstrated increased numbers of these bacteria after prolonged consumption. (Bratthall, 1998)\(^4\)*)* Quote from internet

**CONCLUSION**

Caries activity levels of mutans streptococci did not change in the sucrose group, but was significant reduced in group that received Frozz. Nimms containing sorbitol.

The results suggest that the dose level achieved by using sorbitol - containing candy , did not provide sufficient antibacterial action to suppress mutans streptococci after 3 weeks consumption.

**ACKNOWLEDGEMENT**

The authors would like to thank PT KONIMEX which has been supporting us from the very first beginning of the research.
REFERENCES


----000---

Documented at The Library of Faculty of Dentistry Universitas Indonesia 2002