Control release of fluoride of the toothbrush with sodium fluoride coated bristles*

Ya-Jing Huang, Dan-Jae Lin, Chen-Hao Chen, Jui-Ting Hsu and Tanaka Kimiko

Abstract—This study is to evaluate the control of fluoride releasing of four types of toothbrush with sodium fluoride (NaF) coated bristles. The in-vitro test was conducted using an electric powered toothbrush brushed against a ceramic tooth. The maximum measured fluoride release of coating group were at simulating day 1 (brush 2 times) and significant higher than other time periods. The diameter of the straight type bristles with 15% NaF coating and wavy type bristles with 10%, 15% NaF coating were significant reduced after 42 times brush. We conclude that a toothbrush with coating on surface modified bristles could control the fluoride releasing and act as a dental caries prophylactic device.

I. INTRODUCTION

For prevention and control of caries, the application of fluorides is the most effective method.[1-2] There are advantages of fluoride, including enamel remineralization, anti-acid and inhibiting bacterial metabolism.[3] Toothbrush with 1500ppm fluoride toothpaste is one of the most commonly used adjuncts for maintaining oral hygiene. However, concerning the potential risk of fluorosis and allergies to the toothpaste ingredients, for people desiring to brush their teeth without the use of toothpaste, a toothbrush can release fluoride from the bristles offers an advantage. Zimmer S et al. evaluated the fluoride concentration in unstimulated saliva after using a toothbrush with 9048ppm fluoride as sodium fluoride incorporated in the bristles. Although they found the fluoride concentration (3.81ppm) in the saliva was lower than the control (1.79ppm), which brushed using toothpaste with 1500ppm fluoride immediately after brushing and after 15 minutes. This study was to evaluate the fluoride concentration and pH value changes by different NaF coating on straight and wavy type of bristles.

TABLE I. SAMPLE CODES AND THE BRISTLE TYPE, DIAMETER

<table>
<thead>
<tr>
<th>Sample codes</th>
<th>Bristle type</th>
<th>Diameter</th>
<th>Coatings</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Straight</td>
<td>0.15mm</td>
<td>N.A.</td>
</tr>
<tr>
<td>1-1</td>
<td>Straight</td>
<td>0.15mm</td>
<td>10% NaF</td>
</tr>
<tr>
<td>1-2</td>
<td>Straight</td>
<td>0.15mm</td>
<td>15% NaF</td>
</tr>
<tr>
<td>2-1</td>
<td>Wavy</td>
<td>0.15mm</td>
<td>10% NaF</td>
</tr>
</tbody>
</table>

*Research supported by Blessing co., Japan.
Ya-Jing Huang, Dan-Jae Lin, Chen-Hao Chen and Jui-Ting Hsu are with China Medical University, Taichung, 40402 Taiwan, R.O.C. (Corresponding author Dan-Jae Lin, Tel. +886-4-22053366 ext 7706, djlin@mail.cmu.edu.tw).
Tanaka Kimiko is with Blessing Co., Ltd. 406 Green Chapeau Bldg 5-3-5 kotonoo-cho Kobe-city Hyogo-ken, Japan

II. RESULT

On the first day (after two tests), a significant fluoride release from the fluoride toothbrush could be detected when compared to the other time periods and the control group. The detected fluoride ion concentration of fluoride toothbrush after brushing for two times (1 day) ranged between 0.05–2.11ppm. The straight type bristles with 15% NaF coating (1-2 group) present a highest fluoride concentration as 2.11ppm which had been shown to have the caries preventive effect in earlier studies.[4,5] The pH values after simulate brushed for 1(2), 7(14), 14(28), 21(42) days (times). All groups were similar and have a value around pH of 8. The diameter of the straight type bristles with 15% NaF coating and wavy type bristles with 10%, 15% NaF coating were significant reduced after 42 times brush.

III. CONCLUSION

It can be concluded that a toothbrush with coating on surface modified bristles could control the fluoride releasing and act as a dental caries prophylactic device. However more studies are needed to prove the caries prevention effective provided by the fluorinated toothbrush.

REFERENCES


Preprint submitted to 35th Annual International IEEE EMBS Conference. Received April 8, 2013.