

Tooth paste/tooth brush: Boon or bane for oral hygiene

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ABSTRACT

Sumerians practiced oral hygiene as early as 3000 BC and by the year 1600, Chinese had used bone handle with horse hair bristles as a toothbrush. Since then the toothbrush has undergone drastic changes. In the recent years, toothbrush has evolved in various types and designs based on its relation to shape, size, structure of bristle, material used for bristle, etc.

In spite of all these advancements, toothbrush is still regarded as a carrier of bacteria especially *Streptococcus mutans*. Studies have shown that toothbrushes and paste are colonized by bacteria soon after use. The present study is carried out to determine the presence of microorganism in the toothpaste and used tooth bristles at 15 min and 24 h after brushing.

Key words: Bristles, *Streptococcus mutans*, toothbrush

INTRODUCTION

Sumerians practiced oral hygiene as early as 3000 BC^[1] and by the year 1600, Chinese used bone handle with horse hair bristles as a toothbrush.^[2] Since then the toothbrush has undergone many modifications (shape, size, structure of bristle, material used for bristle, etc.).

In spite of constant improvement, a question still remains whether toothbrushes are safe from bacterial contamination. Toothbrushes are manufactured free of microorganisms.^[3] But, after single use, however, toothbrushes may become contaminated by wide array of bacteria, virus, yeast, and fungi present both in the oral cavity and in the external

environment.^[4] Even after being rinsed with tap water, visibly clean toothbrushes can remain contaminated with potentially harmful germs and these contaminated toothbrushes can be a reservoir for the direct transmission of germs as well as a source for introduction or reintroduction of germs from infected to noninfected tissues.

Lack of universal standards for toothbrushes and increasing evidence pointing to toothbrush as a source of contamination, make the inclusion of toothbrush as a biohazards inevitable. Even today, use of toothbrush and toothpaste are our best armamentarium in the fight against tooth decay, making it vital to know if they can act as a source of bacterial contamination, mainly *Mutans streptococci* (cariogenic or cavity causing bacteria).

The purpose of this study was to determine the presence of cariogenic microorganism in the toothpaste and used tooth bristles at 15 min and 24 h after brushing.

MATERIALS AND METHODS

Twenty-five subjects for the study were selected from the students of College Of Dental Sciences, Davangere. Subjects with a history of antibiotic treatment in the previous month were excluded from the study. All subjects were given a new identical toothbrush and toothpaste. They were requested to follow their normal oral hygiene practices for a period of

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2 weeks and to store their toothbrushes and pastes in the usual storage places. At the end of 2nd week, sample from the bristle were collected from each brush 15 min and 24 h after brushing. Samples of toothpaste left at the opening of toothpaste tube were also collected with the help of sterile straight probe. Samples were placed in Brain Heart Infusion (BHI) broth and incubated for 24 h at 37°C.

Presence of growth was established by appearance of turbidity on BHI broth. Later these samples were inoculated on mitis-salivarius-bacitracin agar plates (differential and selective growth media for Mutans streptococci) and incubated anaerobically at 37°C in an atmosphere of CO₂/H₂/N₂ for 72 h using an anaerobic jar.

Total number of colonies on each plate was counted using colony counter. Representative colonies from appropriate plates were gram stained. Individual groups staining characteristics and bacterial arrangement were used for confirmation of presence of Mutans streptococci.

RESULTS

The numbers of Mutans streptococci colonies seen in the plates are shown in Figures 1-3.

Twenty-eight percent of the toothbrush showed contamination 15 min after brushing with a mean colony forming unit (CFU) count of 1.20 ± 2.12 and almost all (96%) the toothbrushes showed contamination after a period of 24 h with mean CFU count of 71.68 ± 54.96 . Thirty-two percent of the toothpastes showed contamination 15 min after brushing with a mean CFU count of 5.40 ± 14.65 .

DISCUSSION

Results of present study showed that after brushing, 28% of toothbrushes after 15 min and 96% after 24 h were contaminated by significant number of cariogenic bacteria. While in case of toothpastes, the level of contamination was at 32% of the sample. Our results have been in agreement with the findings of previous researches.

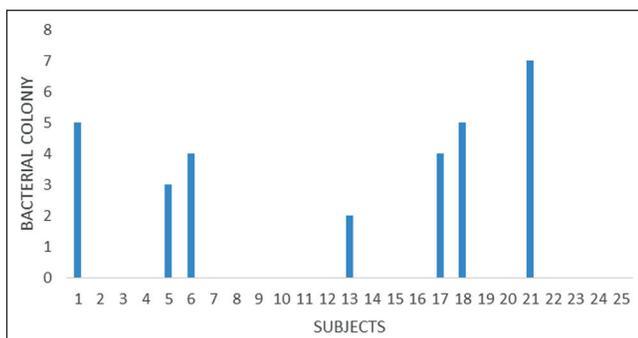


Figure 1. Numbers of Mutan streptococci colonies seen in the plates after 15 minutes of brushing

In 1920, Cobb reported that toothbrushes could be a source of repeated oral infections.^[5] Svanberg showed that toothbrushes and toothpaste tubes can be contaminated by *Streptococcus mutans* after use^[6] and the adherence of *Streptococcus mutans* on toothbrush imparts by bristle wear at 0, 8, and 24 h after air drying.^[7] The retention and survival of *Streptococcus mutans* on toothbrushes varies according to the type of brush.^[8]

Contamination and increasing load of *Streptococcus mutans* can be explained by:

- The increased concentration of sucrose in the biofilm that promotes adhesion of mutans on toothbrush bristles and may cause biofilm formation as well as attainment of distinct colonies on the toothbrush.^[9]
- Improper washing and storage of the toothbrushes after use as most toothbrushes are usually stored in bathroom or combined toilet/bathroom facilities or is open to the environment, and majority of people rinse toothbrush using a finger to manipulate the bristles.
- The uneven surfaces of the bristles of new toothbrushes [Figures 4-6].

In this study, we found that bacterial load increased with increased duration of storage. This finding was similar to the finding of Svanberg, who found that toothbrushes heavily infected with microorganisms especially Mutans streptococci within 24 h of use.

Upon storage, as seen in our samples after 24 h, the bacterial colonies reestablish themselves increasing considerably in numbers. Levels of contamination in toothbrush and toothpaste would also depends on the individuals' oral hygiene and possibly caries activity, as is shown in one of the samples where the colony count is considerably higher than rest of samples.

CONCLUSION

Toothbrushing is the gold standard for proper maintenance of oral hygiene and plaque control. Contamination of toothbrush and toothpaste is relevant to oral health because,

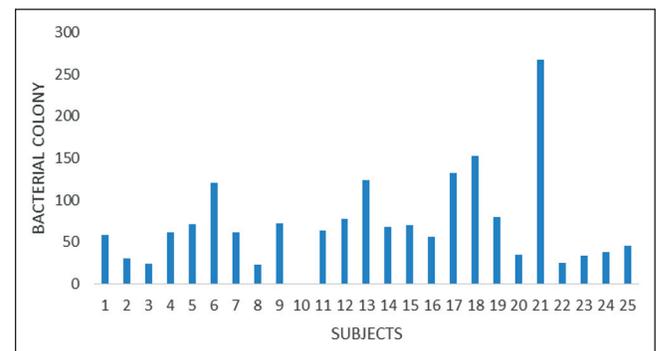


Figure 2. Numbers of Mutan streptococci colonies seen in the plates after 24 hours of brushing

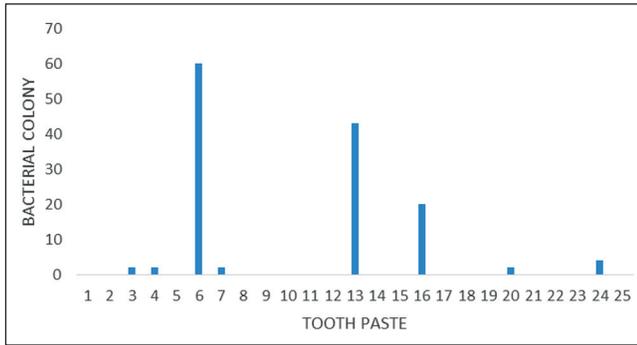


Figure 3. Numbers of Mutan streptococci colonies and contamination of orifices of tooth paste

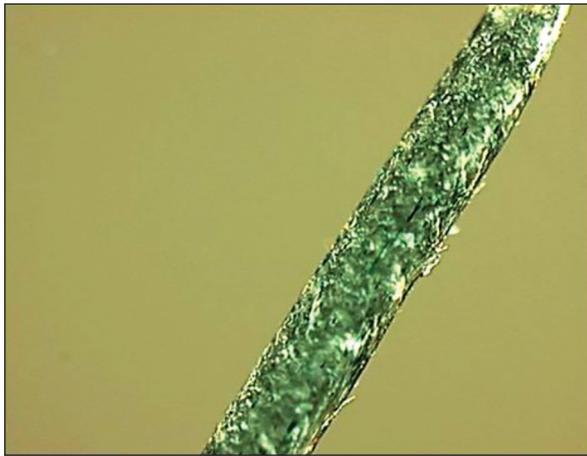


Figure 5. The uneven surfaces of the bristles of new toothbrushes. Trinocular research microscope with polarizing microscope (Olympus, BX 51, Japan)

- A contaminated toothbrush can introduce pathogenic bacteria to new sites within the oral cavity of the same person
- Can cross infect others by contamination of their brushes when stored together. As toothbrushes belonging to different members of the same family occasionally may be in direct contact when stored in same toothbrush holder.
- To conclude we recommend the promotion of rinsing of a toothbrush after brushing based on the finding that more than 96% of the samples showed significant amount of bacterial contamination after 24 h of storage. This will also help to prevent autoinoculation of bacteria into previously uninfected sites in the oral cavity and to prevent other brushes getting cross infected upon storage.

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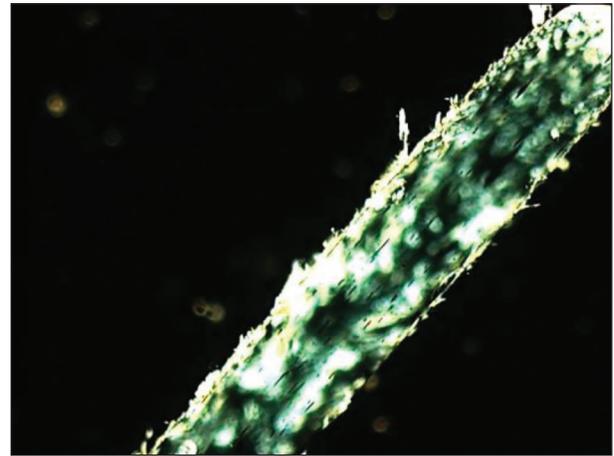


Figure 4. The uneven surfaces of the bristles of new toothbrushes. Trinocular research microscope with polarizing microscope (Olympus, BX 51, Japan)

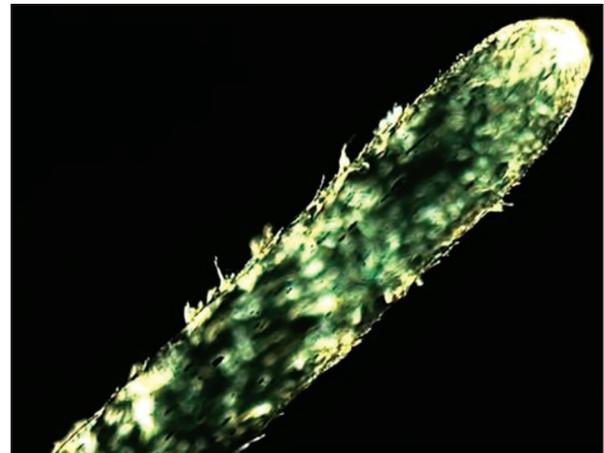


Figure 6. The uneven surfaces of the bristles of new toothbrushes. Trinocular research microscope with polarizing microscope (Olympus, BX 51, Japan)

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