10.5005/jp-journals-10029-1035

ORIGINAL ARTICLE

Toothbrush: A Favorable Media for Bacterial Growth

Rajiv Saini, Varun Kulkarni

ABSTRACT

Introduction: In this era of stem cell transplantation, tissue engineering and piezosurgery, it is important to consider the toothbrush as a source of potential pathogens. As toothbrush plays an important everyday role for personal oral hygiene and effective plaque removal. Oral cavity incubates diversity of microorganisms; therefore it is not surprising that some of these microorganisms were transferred to toothbrush during use. Presence of nutrients, epithelial debris and oral secretions make the toothbrush a favorable media for numerous bacterial growths.

Aim: The main aim of this study was to evaluate the microbial flora predominantly present in toothbrushes.

Materials and methods: Samples of 150 different used toothbrushes from healthy population were taken randomly for microbial analysis. Samples of toothbrushes were put in Robertson cooked meat (RCM) media for both aerobic and anaerobic microbial recognition. Inoculation was done on blood agar and MacConkey's agar plate and culture plates were incubated for 24 hours.

Results: Fifty-four samples showed facultative anaerobes growth, i.e. *Streptococcus mutans, Alpha-hemolytic streptococci,* coagulase negative *Staphylococci* (CONS) and diphtheroids. Sixty-six samples showed polymicrobial etiology and 30 showed purely anaerobic bacteria, i.e. *Bacteroides, Lactobacilli*.

Conclusion: Toothbrush is thus considered a potential biohazard for reintroduction of microorganisms in the oral cavity. New oral hygiene devices like Dental Air Force home dental cleaning system will emerge as true alternative for toothbrush.

Keywords: Toothbrush, Dental Air Force, Microbial growth.

How to cite this article: Saini R, Kulkarni V. Toothbrush: A Favorable Media for Bacterial Growth. Int J Experiment Dent Sci 2013;2(1):27-28.

Source of support: Nil

Conflict of interest: None declared

INTRODUCTION

Toothbrush plays an important role for personal oral hygiene and effective plaque removal. Appropriate toothbrush care and maintenance are also important considerations for sound oral hygiene. As early as 1920, Cobb reported that toothbrushes could be source of repeated oral infection.[1] Retention and survival of microorganisms on toothbrushes represent a possible cause of contamination of mouth. Toothbrushes used regularly become contaminated with microorganisms, which colonize the oral cavity.[2] The bacteria, fungi, viruses can grow and multiply on toothbrush bristles, handles. The area of toothbrush in which tufts are anchored is especially prone to contamination.[3] Fluid and food debris can be drawn into the spaces between tufts by capillary action and this may lead to bacterial growth.[4] Microorganisms are everywhere in our environment and thrive in cool dark places, the type of places people store their toothbrushes. Toothbrushes kept in moist environment like that of bathroom, with its traditional, uncovered spot in bathroom are one of the hot spots for fecal bacteria and germs spewed into air by aerosol effect.[5] Indeed Gerba's studies shown that water droplets in an invisible cloud travel 6 to 8 feet out and up, so the areas of bathroom not directly adjunct to the toilet are still contaminated.[6] Oral cavity is home to hundreds of different types of microorganisms therefore it is not surprising that some of these microorganisms are transferred to toothbrush during the use. So the main aim of this study was to find which microbial flora is predominantly present on toothbrushes.

MATERIALS AND METHODS

The data of this study was collected in 2007. One hundred and fifty different used toothbrushes were collected from oral and systemic healthy population for analysis of bacterial flora in their toothbrush. The present study was conducted in Periodontology Department along with collaboration with microbiological department of Pravara Institute of Medical Sciences, Loni, Maharashtra, India.

Protocol followed for Sample Collection

The toothbrushes were collected from both male and female, and in all age groups. Screening questionnaire examination was performed to rule out presence of any oral and systemic disease. Place of storing toothbrush, frequency of brushing, time period of toothbrush use was also recorded. Toothbrushes were collected only during morning hours to avoid drying of bristles. Collected toothbrushes were put in sterile plastic bags for immediate transfer to microbiology laboratory.

Protocol followed for Microbiological Analysis

Collected samples of toothbrushes were first dipped (head down) in Robertson cooked meat (RCM), both for analysis of aerobic and anaerobic flora. After 24 hours incubation of RCM in incubatory from the superficial portion of the tube, inoculation was done on Blood agar and MacConkey's agar plate. Further incubated for 24 hours and then from the colony morphology, biochemical reactions, the

organisms was identified.[7] While after 48 hours of incubation of the same RCM from deeper portion or where meat particles are there, inoculum was taken and put on Blood agar which contains neomycin, vitamins K, and hemin that incubated the plates for 48 hours in anaerobic jar. The colonies were identified and biochemical reactions performed by standard techniques.

RESULTS

Results showed the presence of aerobic and facultative anaerobes (Table 1), anaerobic bacteria (Table 2) and polymicrobial flora (Table 3). The results were expressed in cell forming unit cfu/ml.

Table 1: Aerobic growth/facultative anaerobic growth

No.	*No. of samples*	*Microorganisms detected*
1	24	*Pseudomonas*
2	21	*S. mutans*, Coagulase-negative *Staphylococci (CoNS)*
3	06	Diphtheroid
4	03	*S. sanguis, Micrococci, CoNS*

Expressed in cell forming unit cfu/ml

Table 2: Anaerobic growth

No.	*No. of samples*	*Microorganisms detected*
1	09	*Bacteroides*
2	06	*Lactobacilli*
3	15	*Leptotrichia*

Expressed in cell forming unit cfu/ml

Table 3: Polymicrobial growth

No.	*No. of samples*	*Microorganisms detected*
1	30	*S. mutans,* Coagulase-negative *Staphylococci, Micrococci, Leptotrichia*
2	36	*S. mutans,* Coagulase-negative *Staphylococci, Lactobacilli*

Expressed in cell forming unit cfu/ml

DISCUSSION

In this day of organ transplant and alteration of immune system, it is important to consider toothbrush as a source of potential pathogen. It is clear from the above facts that all of the presently available toothbrushes have the ability to be infected by a wide range of microorganisms, including microbial flora that grow well on toothbrush. Given the fact that very often people will traumatize themselves with their toothbrush, their trauma may become a potential portal entry for organisms. So, it is apparent that present toothbrushes which were basically designed years back need to be re-evaluated.[8] Toothbrush may even have bacteria on them right out of the box.[9] The new FDA approved innovative devices like Dental Air Force home dental cleaning system will emerge as a true alternative for conventional toothbrushing in regular practice.[10] The manufacturer recommends twice a day usage for 5 minutes as a part of the regular oral hygiene. The appliance uses a precision jet of air to deliver water and dental cleaner to 'power wash' the mouth. Dental Air Force uniquely dispenses the dental cleaner by you controlling the amount of cleaner that is dispensed in your mouth. One normal application uses one teaspoon of dental cleaner. The cleaner ingredients include sodium bicarbonate, the most widely accepted and totally natural buffering agent that promotes a neutral environment. It also contains mint flavoring, xylitol and stevia as natural sweeteners. The formula is free of sodium laurel sulfate, the ingredient in most toothpaste that causes sensitivity and irritation. Dental Air Force home dental cleaning system with access to subgingival area lead to removal of biofilm and prevent further proliferation of periodontopathic microorganisms as compared to toothbrush.

REFERENCES

1. Cobb CM, Toothbrush as a source of repeated oral infections in the mouth. Boston Med J 1920;183:263-69.
2. Taji SS, Rogers AH. The microbial contamination of toothbrushes: A pilot study. Aust Dent J 1998;43:128-30.
3. Bienenbraeber V, Sponholz H, Hagin J. Characteristics of bristle end rounding and anchoring in brand new and used adult's toothbrushes (in German). Dtsch Zahnarztl Z 1995;50:517-24.
4. Althaus D, Kockapan C, Wetzel WE. Bristle end rounding and anchoring in children's toothbrushes (in German). Schweiz Monatsschr Zahnmed 1990;100:159-64.
5. Thompson K. Harvard Gazette book review-Overkill. Kimberly Thompson. Harvard Gazette Archives 2002.
6. Gerba CP, Wallis C, Melwick JL. Appl Environ Microbiol 1975;30(2):771-80.
7. Mackie and McCartney's. Practical medical microbiology (14th ed). In: College JG, Fraser AG, Marmion BP, Simmons A (Eds). New York: Churchill Livingstone 1996:501-19.
8. Saini R, Saini S. Microbial flora on toothbrush: At greater risk. Ann Nigerian Med 2010;4:31-32.
9. Glass RT, Lare MM. Toothbrush contamination: A potential health risk. Quintessence Int 1986;17:39-42.
10. Saini R. Periodontal health 2020: The future outlook. Int J Experiment Dent Sci 2012;1(2):V.

ABOUT THE AUTHORS

Rajiv Saini (Corresponding Author)

Assistant Professor, Department of Periodontology, Pravara Institute of Medical Sciences, Ahmednagar, Maharashtra, India, Phone: +91-9923206789, e-mail: drperiodontist@yahoo.co.in

Varun Kulkarni

General Dentist, Patil Dental Care, Mumbai, Maharashtra, India