

Original Research

## Effect of Green Tea on Salivary Ph and Streptococcus Mutans Count in Healthy Individuals

Sangameshwar M, Vanishree M, Surekha R, Santosh Hunasgi, Anila K, Vardendra Manvikar

### Abstract

**Aim:** Green tea is a well known, healthy beverage and is an important source of polyphenol antioxidants. Beneficial effects of green tea include such as protection against dental caries, periodontal disease and tooth loss and found that can a decrease in streptococcus mutans count as well as increase in pH. Hence the present study was carried out to evaluate and compare pH of saliva before and after the intake of green tea and to evaluate the role of green tea on growth of oral bacteria in culture using saliva. **Material and Methods:** Unstimulated saliva was collected from 30 healthy individuals aged between 20-30 years. The pH of saliva was determined before, immediately after and 10 min after drinking green tea using pH electrode. The microbial load was assessed using nutrient agar and mitis salivarius agar by collecting saliva before and immediately after intake of green tea. Data were analyzed using ANOVA followed by post hoc dunnet multiple comparison test.  $p < 0.05$  is considered as statistically significant. **Results:** There was significant difference between salivary pH before, immediately after and after 10 min ( $p < 0.0001$ ) of intake of green tea. There was significant difference between salivary streptococcus mutans count before and after ( $p < 0.001$ ) intake of green tea. **Conclusion:** The result of the present study has proved that consumption of green tea inhibit salivary Streptococcus mutans count and cause reduction of pH in saliva. So, it could be advisable to encourage the regular consumption of this widely available, tasty and inexpensive beverage as an interesting alternative to other drinks.

**Key Words:** Green Tea; Salivary Ph; Streptococcus Mutans; Saliva; Oral; Dental Caries.

*Sangameshwar M, Vanishree M, Surekha R, Santosh Hunasgi, Anila K, Vardendra Manvikar. Effect of Green Tea on Salivary Ph and Streptococcus Mutans Count in Healthy Individuals. International Journal of Oral & Maxillofacial Pathology; 2014;5(1):13-16. ©International Journal of Oral and Maxillofacial Pathology. Published by Publishing Division, Celesta Software Private Limited. All Rights Reserved.*

### Introduction

Green tea (*Camellia sinensis*) has been considered, in traditional Chinese medicine, as a healthful beverage and one of the most widely consumed beverages in the world. Green tea is an important source of polyphenol antioxidants. The main polyphenols in green tea are catechins and also consists of proteins, carbohydrates, lipids, vitamins, pigments and minerals.<sup>1,2</sup>

Green tea extracts contain different phytochemicals with biological properties that promote human health and help reduce the risk of chronic disease. The antioxidant phytochemicals present are carotenoids, tocopherols, ascorbic acid, nutrient phytochemicals generally classified as flavonoids. Among these, the polyphenols and catechins constitute the most interesting group of tea leaf components: epicatechin, gallic acid, and catechins.<sup>1,2</sup> Recent human studies suggest that green tea may contribute to a reduction in the risk of cardiovascular disease and some forms of cancer, as well as to the promotion of oral health and other physiological functions, such as antioxidant and antibacterial activities, antihypertensive effect and body weight control.<sup>2,3</sup>

Beneficial effects of green tea include such as protection against dental caries, periodontal disease and tooth loss. Few studies stated that after green tea consumption there was significant reduction of the salivary levels of the cariogenic pathogens such as streptococcus and lactobacilli and increase in the pH levels.<sup>3-5</sup> Hence the present study was carried out to evaluate and compare pH of saliva before and after the intake of green tea and to evaluate the role of green tea on growth of oral bacteria in culture using saliva.

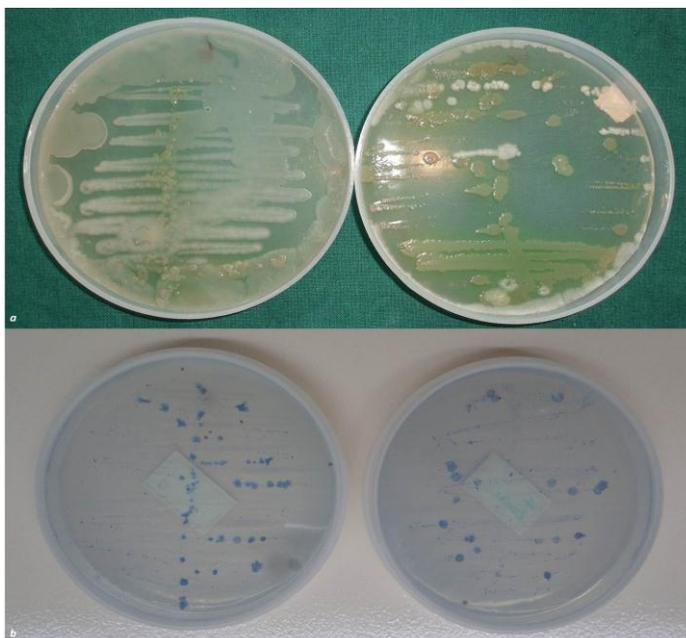
### Material and Methods

A sample comprising of 30 healthy students aged between 18-30 years who are studying in our institution were randomly selected. These students have good oral hygiene. A patient with systemic diseases was excluded from the study. A patient below 18 years and above 30 years was excluded from the study.

Green tea was prepared by boiling 120ml water followed by dipping of 2gm of Green tea powder sachet (2gm/120ml) for 2 minutes. Unstimulated saliva was collected into a sterile plastic disposable container

before consumption, immediately after and 10 minutes after consumption of green tea. The pH of saliva was determined using Elico pH Meter (LI 120 Indian). The saliva sample collected before and after intake of green tea was inoculated in nutrient agar and mitis salivarius agar. The media plates were incubated for 48 hours at 37°C. Following

incubation, counting of colonies was done manually. The count of streptococcus mutans was expressed as a number of colony forming units per millilitre (CFU/ml) of saliva. (Figure 1) The data was analyzed using ANOVA and post hoc dunnet multiple comparison test and P value <0.05 was considered as significant.



**Figure 1:** Evaluation of bacterial count before and after the intake of green tea (a) and streptococcus mutans (b).

## Results

The mean, standard deviation, and p-value of all salivary pH and bacterial load levels seen in patients were calculated and compared. The pH of saliva before, immediately after and after 10 min of intake of green tea was  $8.01 \pm 0.24$ ,  $8.47 \pm 0.25$  and  $8.42 \pm 0.25$  respectively (Table 1 and Graph1). On comparison there was significant difference between salivary pH before, immediately after and after 10 min ( $p < 0.0001$ ) of intake of green tea. Comparison of salivary pH between, before

and immediately after intake of green tea showed a significant difference ( $p < 0.01$ ). Comparison of before and after 10 minutes of intake of green tea also showed a statistically significant difference. ( $p < 0.01$ ) The salivary streptococcus mutans count before and after intake of green tea was  $79.07 \pm 10.7 \times 10^3$  CFU/ml and  $72.7 \pm 9.22 \times 10^3$  CFU/ml (Table 2 and Graph 2). There was significant difference between salivary streptococcus mutans count before and after ( $p < 0.001$ ) intake of green tea.

pH Before	pH Immediately after	pH After 10 min	Standard Difference (sd) [before- immediately after]	Standard Difference (sd) [before- after 10 min]	P-value
$8.01 \pm 0.24$	$8.47 \pm 0.25$	$8.42 \pm 0.25$	0.46 (0.09)	0.41 (0.11)	$P < 0.0001$

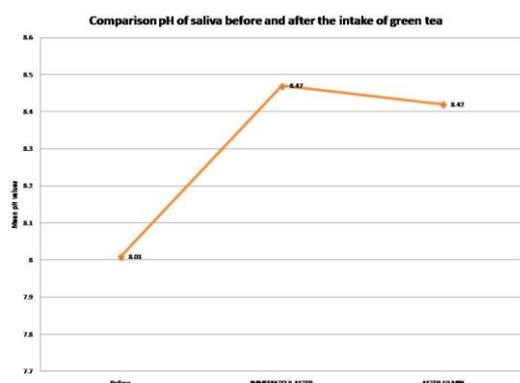
Table 1: Comparison of pH of saliva before and after the intake of green tea

Streptococcus mutans count of saliva ( $\rightarrow \times 10^3$ CFU/ml)	Before	After	Mean difference	p-value
	$79.07 \pm 10.7$	$72.7 \pm 9.22$	6.30	$P < 0.001$

Table 2: Comparison of streptococcus mutans count before and after the intake of green tea

## Discussion

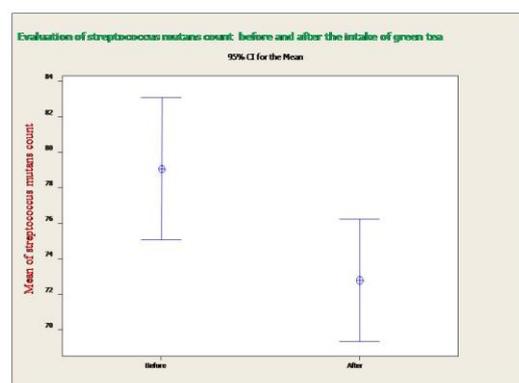
In the last few years, an increased attention has been focused on the natural plant extracts, especially those containing phenolic compounds with antimicrobial and antioxidant properties. Tea is one of the important dietary sources of these compound.<sup>[9,11]</sup> In recent years, there is a growing interest in green tea due to scientific findings which shows the health potentials of the beverage. Green tea polyphenols act as anticariogenic and antibacterial agents.<sup>8,9</sup> Catechins present in green tea represent marked effect on PH value of saliva and dental plaque concern it s reduction after eating towards acidic state and preserve it within normal range. Moreover, green tea extracts usage showed enhancement in Gingival Bleeding Index (GBI) due to it is high content of catechins, so, oral application of catechins posses' positive influence on the gingival and periodontal structures concerning gingivitis and periodontitis.



**Graph 1:** Comparison of pH of saliva before and after the intake of green tea

In our study, there was statistically significant increase in pH of saliva after intake of green tea. The possible reason could be due to the presence of epigallocatechin gallate polyphenol in green tea which causes reduction in acid production by inhibiting lactate dehydrogenase and alpha-amylase enzyme.<sup>1,3</sup> which probably help to decrease caries incidence when it was taken after food intake. When the microbial load was assessed, there was significant decrease in the streptococcus mutans count after intake of green tea. Decrease in the microbial count could be due to the inhibitory and bactericidal effect of catechins present in the green tea. Several workers demonstrated the antibacterial effect by a mechanism inhibiting glucosyl transferase from

streptococcus mutans after intake of green tea.<sup>4,5,10-12</sup> Our study results were similar to that obtained by Takashi (2005)<sup>12</sup>, Awadalla et al (2011),<sup>13</sup> Chatterjee (2012)<sup>14</sup> and Abd Allah et al., (2012).<sup>8</sup> Awadalla et al in his study showed that there was a statistically significant difference among subjects pre- and post-rinsing with 2% green tea for 5 min concerning S. mutans count in saliva and plaque, salivary and plaque pH values and GB.<sup>13</sup> Takashi (2005) stated that rinsing with green tea regularly exhibit reduction in plaque S. mutans levels and inhibit cellular adhesion to teeth and he concluded that these effects collectively play great part in caries prevention.<sup>12</sup> Based on these findings, we hypothesize that green tea could have an effective anticariogenic property and thus can be used to decrease the caries incidence. For a study like this discussion is too short.



**Graph 2:** Evaluation of streptococcus mutans count before and after the intake of green tea

## Conclusion

The results of the present study may prove that consumption of green tea inhibit salivary Streptococcus mutans count and cause increase in pH of saliva and act as an effective natural measure to combat dental caries. So, it could be advisable to encourage the regular consumption of this green tea be widely accessible, tasty and inexpensive beverage as an interesting alternative to other drinks.

## Acknowledgement

We would like to acknowledge staff members, Department of Oral Pathology, for helping us in preparation of the manuscript.

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Source of Support: Nil, Conflict of Interest: None Declared.