The Journal of Community Health Management 2024;11(2):54–56

Content available at: https://www.ipinnovative.com/open-access-journals

The Journal of Community Health Management

Journal homepage: https://www.jchm.in/

Review Article

# Let the black tea and green tea take care of your oral health — A short review of the antimicrobial activity of black tea and green tea extracts on *Streptococcus mutans*

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ARTICLE INFO

*Article history:*
Received 28-05-2024
Accepted 03-06-2024
Available online 20-07-2024

*Keywords:*
Antibacterial activity
Green tea
Streptococcus mutans
Black tea

ABSTRACT

Dental caries is a major global concern and source of great trouble worldwide. It is one of the most common chronic oral diseases in the world that affects both adults and children. The prevalence of DMFT index as a diagnostic criterion in the estimation of dental caries in the age group of 3–18 years was found to be 57%, whereas in patients aged above 18 years, it was much higher that is 77%.

Many studies have been carried out all over the world to find the cause behind it, and the main cause, which was well accepted by the people, was the action of pathogenic bacterial microflora such as *Streptococcus mutans* (*S. mutans)* in the oral cavity on the tooth surfaces. These bacteria strongly adhere to the tooth surface and produce lactic acid after fermentation of sucrose and various carbohydrates, which is responsible for the cavitation in the teeth. Many experiments and efforts have been made to remove *Streptococcus* from the oral cavity, like antibiotics, oral drugs, and more, which are beneficial but have side effects after long-term use, such as vomiting, diarrhea, resistance, teeth staining, etc.

That's why search ended at tea which is becoming a popular beverage and a widely consumed drink these days that has anti-streptococcal properties with least of side effect.

India's tea usage changed over time from being a colonial export to a regular beverage. With over 29% of the global tea production, India is one of the world's biggest producers and consumers. In India, tea has long been closely linked to the medicinal herbs that have long been used for both therapeutic purposes and general well-being.



## 1. Background

Tea is obtained from dispensation of the tender leaves and buds of the *Camellia sinensis* plant and is divided into two categories: non-fermented tea (green tea) and fermented tea (black tea).[1]

1. Green tea is obtained by drying of the *Camellia* leaves so as to remove moisture followed by steam treatment.

2. Black tea is obtained by firstly drying of the leaves to remove moisture and then rolled and allowed to ferment.[2]

In black tea, these catechins are converted to higher molecular weight polyphenolic compounds like flavons, which give black tea its unique flavor and color. In contrast, green tea is distinguished by the prevalence of non-oxidized phenolic compounds called catechins, which are responsible for the antioxidant capacity.[3]

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https://doi.org/10.18231/j.jchm.2024.012

## 2. Introduction

*S. mutans* is a gram-positive facultative anaerobic bacteria that is part of the normal flora of oral bacteria. It is one of the most important cariogenic bacteria because it ferments various sugars and is tolerant of acidic environments. The bacterium's growth and metabolism promote changes in the oral environment, which in turn allows other bacteria to also colonize the teeth and lead to the formation of dental biofilm. Reducing the intake of sugars, brushing, flossing, and using antimicrobial mouth rinsing solutions can help to control the growth of cariogenic bacteria.[4]

Nowadays, the market is starting to carry a growing number of sugar-filled soft drinks. Children are among the clients, as are adults. This has led to serious concerns about the effects on their health. There was a clear correlation between the sugar content of these beverages and dental health. They accomplish this by changing the pH of dental plaque and saliva, which compromises the integrity of teeth. Plaque bacteria convert these sugars into acids, which in turn decrease salivary pH and demineralize teeth. Thus, it is evident that soft drinks and dental caries are directly related.[5]

Medicine has established the use of plants for thousands of years. The curiosity about naturally derived biological compounds that may have the potential to be used as therapeutics in medicine and dentistry is rising due to their minimal side effects.[6]

Hence, the introduction of green tea and black tea took place, which not only presented a new taste or flavour but also provided several therapeutic uses.[6,7]

## 3. Discussion

When we go back to the 18th century, it was Miller who came up with a proposal of acidic theory, which stated that dental plaque, when exposed to an increase in sucrose levels, leads to acid production, causing a drop in pH and leading to the initiation of dental caries. The pathogenic factor of low salivary pH facilitated the growth of acidogenic bacteria, causing a dynamic imbalance between demineralization and remineralization on the tooth's hard surface, ultimately resulting in cavitation.

The results of this investigation indicated a more encouraging rise in salivary pH.[8] After 30 minutes of consuming a sugary soft drink, the average pH was 5.75. After being rinsed with black and green tea, the salivary pH rose to 6.85 and 7.11, respectively. Further research by Srinidhi et al. in 2014 revealed that salivary pH increased following rinses with black and green tea.[9]

1. The activity of tea's constituents against the microorganisms that cause oral illnesses has been the subject of numerous prior published studies and discussions.
2. Studies have demonstrated that tea extracts are efficient against cariogenic germs and inhibit the attachment of bacteria to dental surfaces.[10]
3. It was found that using green tea as mouthwash significantly reduced the amount of cariogenic bacteria, such as *S. mutans* and *Lactobacillus*.[11]
4. Catechins were believed to have antibacterial and antiplaque effects. By interacting with the microorganism's barrier function and causing its depletion, they helped to prevent dental cavities.[12,13]
5. The bioactive constituents of green tea possess the ability to impact the caries development process via many ways: they may inhibit the proliferation of the streptococcal agent or act as inhibitors of glucosyl transferase and amylase.[14]
6. The biological properties of tea also include effects on the Central/CNS System. Black tea exclusively contains antioxidants and other substances such as methylxanthines, caffeine (antioxidant), and phenolic compounds, specifically catechins, that might help protect the heart and blood vessels.[15,16]
7. It is also used to treat low blood pressure, headaches, and heart attacks. It also prevents heart disease, including atherosclerosis, or "hardening of the arteries."[17]

Despite limited oxidation during processing, green tea manages to retain significant chemicals known as polyphenols, which may be able to reduce joint degeneration, protect cartilage between bones, and prevent inflammation and swelling. They seem to be capable of combating infections caused by the human papillomavirus (HPV).[18]

## 4. Conclusion

Hence, we now come to the inference that green and black tea has anti-streptococcal properties as well as numerous other therapeutic benefits that could make them effective antimicrobial agents for a range of oral cavity infections. The flavonoids and antioxidants in tea are responsible for its positive effects on overall health. Additionally, it is shown that drinking both black and green tea increased salivary pH, which contributed to the substantial reduction of cariogenic bacteria in the oral cavity. Hence, decreasing sugar-sweetened beverage consumption and promoting naturally derived tea products could be a leap forward to good oral hygiene in the future.

## 5. Source of Funding

None

## 6. Conflict of Interest

None

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**Cite this article:** Singh SK, Gupta A, Mathur T, Roy S. Let the black tea and green tea take care of your oral health — A short review of the antimicrobial activity of black tea and green tea extracts on *Streptococcus mutans*. *J Community Health Manag* 2024;11(2):54-56.