

# The antimicrobial effect of different toothpastes on *Streptococcus mutans* bacteria

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## Abstract

The persistence of antimicrobial action of toothpaste can be demonstrated by observing the magnitude of reduction of oral bacteria caused by the toothpaste. *Streptococcus mutans* is commonly considered the main microbe in the formation of dental caries. Toothpastes work to destroy oral bacteria, *S. mutans* included, so in order to determine the most effective toothpaste, it must be discovered which is the most effective at killing the bacteria. Solutions comprised of 5% *S. mutans* bacteria, and 1% and 2% toothpaste were tested to discover which toothpaste killed the most bacteria, as well as which one had the lowest LD50 concentration. Solutions were plated and incubated for 24 hours and colony growth was compared to a control. Colgate Total contains the active ingredient, Triclosan, which is said to have higher antimicrobial capabilities than sodium fluoride. It also carries the ADA recommendation label. Results concurred that the Colgate Total was in fact far superior to other toothpastes in regard to killing bacteria.



## Procedure

- Tests were run to determine the serial dilution that provided a countable number of colonies (5% conc. bacteria)
- Toothpastes were added to bacterial solutions in 2% and 1% concentrations and vortexed
- Solutions were plated via sterile cue tip on Tryptocase Soy Agar plates and incubated for 24 hours; a separate control was made for each trial
- Bacterial colonies were counted using a colony counter and compared to the control to obtain data



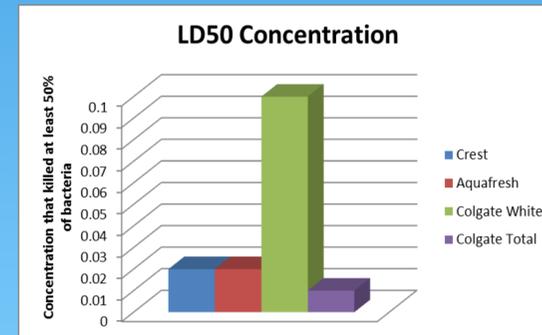
## Results

2% Toothpaste Conc.	Total # of surviving colonies	1% Toothpaste Conc.	Total # of surviving colonies
Control	639	Control	265
Crest	261	Crest	469
Aquafresh	325	Aquafresh	403
Colgate White	453	Colgate White	484
Colgate Total	73	Colgate Total	17

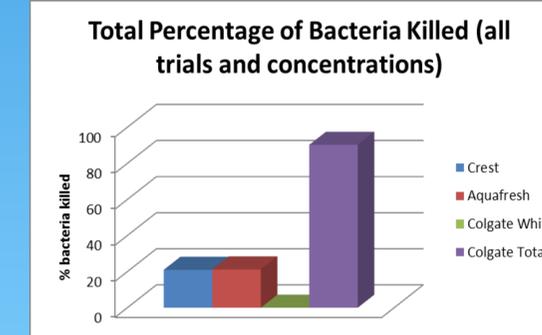
- The chart on the left side shows the total number of surviving colonies when 2% of the overall solution was toothpaste
- The chart on the right shows the same data for 1% overall toothpaste solution
- Colgate Total far exceeded the ability of any other toothpaste to kill bacteria
- Every toothpaste was able to kill at least 50% of the bacteria at these concentrations (Aquafresh and Crest = 2%; Colgate Total 1%) except Colgate White
- While controls did vary greatly overall toothpastes were less effective at the lower concentration with the exception of Colgate Total which actually was more effective
- One trial had to be omitted due to an uncountable number of colonies
- A 2-way proportionality Z-test was run to test significance and all p-values < .001

## Introduction

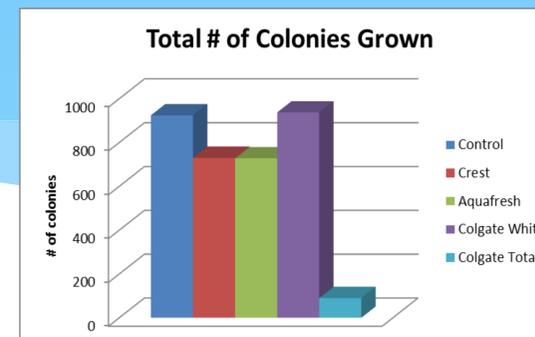
- *Streptococcus mutans* is the leading cause of dental caries worldwide
- *S. mutans* is most cariogenic of all oral *Streptococci*
- Metabolizes sugar to produce acid that causes cavities
- 3 steps to good oral health
  - Flossing releases bacteria between gums
  - Mouthwash provides a layer of prevention against plaque
  - Toothpaste effectively destroys oral bacteria
- Which brand of toothpaste kills *S. mutans* most effectively
- Colgate Total contains relatively new ingredient called Triclosan
  - Triclosan is found in antibacterial products such as soap, body wash, detergents, and toothpastes
  - Colgate Total also carries with it an ADA recommendation label



This graph shows the concentration of toothpaste it took to kill over 50% of the bacteria.  
\*Colgate White never achieved an LD50 in any of the concentrations tested



This graph shows the total percentage of bacteria killed in both trials in comparison to the control.  
\*The final colony count for Colgate White was higher than the control which is the reason the graph shows 0%.



This graph shows the total number of surviving colonies for each parameter.



## Discussion

Experimentation proved that the Colgate Total was in fact far more effective at killing *S. mutans* bacteria than the other toothpastes tested. Colgate Total killed over 90% of the cultured *S. mutans* while the next leading toothpaste was just over 20%. Colgate Total also had the lowest LD50 concentration of toothpaste. Even though the results strongly suggest that for the highest quality dental care consumers should use Colgate Total, there is another aspect of the toothpaste consider. While the active antimicrobial ingredient in Colgate Total, Triclosan, has been approved by the FDA for usage in consumer products there is a swell of controversy surrounding the chemical. Recent studies, have suggested that Triclosan can alter hormone regulation in animals (although no human testing has confirmed this) as well as causing bacterial resistance to antibiotics. In lieu of these findings the FDA has continued research into these allegations, yet at the moment Triclosan is still considered safe for human use. Triclosan (Colgate Total) has obvious advantages in killing bacteria and preventing oral disease, yet it is ultimately up to the consumer to decide if the benefits outweigh the potential risk.

## Acknowledgements

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