



## RESEARCH ARTICLE

# COMPARATIVE EVALUATION OF INHIBITORY EFFECT OF DIFFERENT FLUORIDE RELEASING AGENTS ON STREPTOCOCCUS

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### ABSTRACT

**Background:** Sensitivity is very common in most people and varnish is used to relieve sensitivity and also to prevent dental caries. Three different fluoride releasing agents MI Varnish, VOCO PROFLUORID and 60 second taste. Streptococcus mutans is the bacteria that cause progression of caries and hence it is important to test the inhibitory effect of fluoride releasing agents on streptococcus mutans.

**Materials and methods:** A sample size of 10 culture plates of nutrient agar is used. The three fluoride varnishes are placed on the culture plate that is swabbed with streptococcus mutans and a lawn culture is done. The culture plates are observed after 24 hours and the length of inhibition is noted.

**Results:** The bacterial inhibition in the culture is measured after 24 hours. It was found that phosphate fluoride gel by pascal company showed the most inhibition of about 26mm, ACP-CP showed a bacterial inhibition of 12mm, and Sodium fluoride did not show any bacterial inhibition. This shows that phosphate fluoride is the most effective fluoride-releasing agent in inhibiting streptococcus mutans growth in the oral cavity.

**Conclusion:** This research shows that all fluoride varnishes are not effective in inhibiting bacterial growth, and that it depends on the composition. Sodium fluoride is not effective in the reduction of bacterial growth whereas phosphate fluoride varnishes show the best results. Thus it is advisable to use phosphate fluoride varnishes for better results.

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## INTRODUCTION

Dental caries is a widespread, chronic, infectious disease that affects the hard tissues of teeth. It is an external process that starts either at the enamel of the crowns or at the cementum or dentin covering the roots (Fejerskov, 2003; Nisengard, 1994). Dental caries has been traditionally described as a multifactorial disease that involves the interaction of various factors like host, agent, substrate, and time. Most important in the understanding of caries process is that dental caries does not occur either in the absence of dental plaque or dietary fermentable carbohydrate, hence it is considered as a dietobacterial disease (Shafer et al., 1993; Van Houte, 1994). Plaque is a soft, translucent, and tenaciously adherent material accumulating on the surface of teeth. A number of endogenous oral microorganisms found in dental plaque are considered crucial to the initiation and progression of dental caries. Lactobacillus aids in the initiation of dental caries in the oral cavity and Mutans Streptococci aids in its progression (Marsh, 1999).

Mutans streptococci possess all virulent traits, which support their role in the caries process. They become pathogenic only under conditions that lead to frequent and prolonged acidification of the dental plaque. Mutans streptococci gain a selective advantage over other microorganisms as a result of their aciduric properties. They adapt to the low pH of this environment and this increase their rate of acid production and drive the pH lower resulting in a cariogenic plaque (Zero, 1999). The prevention of dental caries is still an important and time consuming task. The cariostatic effect of topical fluoride agents has generally been related to their ability to deposit fluoride in the enamel and to their depth of penetration. At the same time, the bacterial inhibition of these fluoride releasing agents should be tested in order to get better results clinically.

## MATERIALS AND METHODS

The aim of the research was to check the inhibitory effect of different fluoride releasing agents on streptococcus mutans. Three fluoride-releasing agents were chosen according to its availability and frequency of use by dentists.

**VOCO PROFLUORID:** It is a 5% sodium fluoride varnish with a creamy consistency. Voco is used to reduce

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hypersensitivity, treat cervical areas, to enhance enamel acid resistance, to boost salivary fluoride levels, anticaries activity. It is applied with a brush applicator and washed off with water and brushing should be avoided for the next 4 hours.

**MI VARNISH:** The contents of MI Varnish are calcium, phosphate and fluoride and it is of a flowable consistency and helps in reducing sensitivity, treatment of cervical areas and anticaries activity. The method of application is similar to VocoProfluorid.

**60 SECOND TASTE:** Is a phosphate fluoride releasing agent which is of a gel consistency and helps in the prevention of caries. A fluoride tray is used for its application and is wiped with cotton in 60 seconds and the patient is instructed not to eat or drink water for 30 mins.

0.5ml of all the fluoride varnishes are measured and 10 samples each are obtained. Nutrient agar culture plates are utilised to culture streptococcus mutans. Streptococcus mutans are swabbed over 10 culture plates with each culture plate containing all three fluoride releasing agent. Lawn culture is done by placing the standard quantity of three fluoride releasing agents on each culture plate. Streptococcus mutans is cultured for 24 hours and the culture plates are examined for bacterial inhibition.



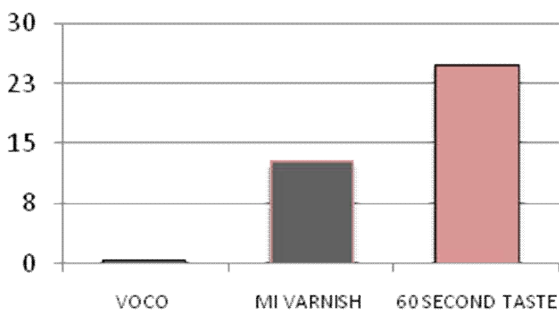
Culture after 0 hours



Culture after 24 hours

**RESULTS**

The bacterial inhibition in the culture is measured after 24 hours. It was found that phosphate fluoride gel by pascal company showed the most inhibition of about 26mm, ACP-CPP showed a bacterial inhibition of 12mm, and Sodium fluoride did not show any bacterial inhibition.



	Mi varnish	Voco profluorid	60 second taste
Mean	12.9mm	0.4mm	25mm
SD	0.943398	0.489897	1.612451
P value	0.16	1	0.003

P > 0.05 - Not significant  
 P < 0.05 - Significant  
 P < 0.01 - Highly significant  
 P < 0.001 - Very highly significant

This shows that phosphate fluoride is the most effective fluoride-releasing agent in inhibiting streptococcus mutans growth in the oral cavity.

**DISCUSSION**

The products used for this research is of three consistencies, the amount of fluoride and phosphate content was more in gel consistency in comparison to the flowable and creamy consistency. A similar research done by Munshi (2001) used alternate fluoride varnishes (Fluoritop, fluor protector, bifluorid) to check inhibition on streptococcus mutans and fluor protector gave the best results which also had a gel consistency. Bifluorid and Fluoritop with a sodium fluoride composition shows mild or no results and this is not effective. This research was mainly done to assess the bacterial inhibition, which cannot be assessed by determining the amount of fluoride release. A research by Castillo (Castillo, 2004) assessed fluoride releasing agents but only the amount of fluoride release was checked but the activity of fluoride in the oral cavity was not assessed. Thus it does not prove that bacterial growth has been inhibited in the oral cavity. With the results of this research and other research we can also come to an assumption that bacterial inhibition is not due to fluoride, but it is due to phosphate.

This can be proved because 60 second taste which gave the best result has 50% phosphate in its composition. Similarly MI varnish which also showed mild results had 25% phosphate in its composition. The varnish which shows on results (VOCO PROFLUORID) did not have any amount of phosphate because it was a sodium fluoride varnish. Thus this proves that phosphate is the reason behind bacterial inhibition but not fluoride. A research done by Munshi (Shruti Girish et al., 2016) also supports this theory, as fluor protector which showed maximum inhibition also had phosphate in its composition and the other varnishes without phosphate did not show results. Similarly a research done by Arzu Pinar Erdem tested fluoride varnishes on streptococcus mutans, he concluded saying that fluoride release was highest during the 24<sup>th</sup> hour but this showed negative results in the inhibition of streptococcus mutans. The varnished which did not have phosphate contained the most number of bacteria whereas fluor protector which contains phosphate showed positive results on streptococcus mutans inhibition.

**Conclusion**

This research shows that all fluoride varnishes are not effective in inhibiting bacterial growth, and that it depends on the composition. Sodium fluoride is not effective in the reduction of bacterial growth whereas phosphate fluoride varnishes show the best results. Thus it is advisable to use phosphate fluoride varnishes for better results.

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