Prophylactic effect of yogurt on

_Fusobacterium nucleatum_ in the mouth

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Abstract

Periodontal diseases are closely related to the activity of bacteria that are present in the mouth. *Fusobacterium nucleatum* can damage oral tissue and promote aggregation of potentially pathogenic organisms within the oral cavity. Yogurt is a probiotic product that can limit the growth of periodontal pathogens *in vitro*. The purpose of this research was to determine the prophylactic effect of yogurt in preventing the growth of *F. nucleatum* in the mouth. The oral microbial flora of six volunteers were sampled once per day for 14 days before lunch in order to compare the numbers of *F. nucleatum* before and after the treatment. Ingestion of yogurt caused an average 33.6% decrease in the numbers of *F. nucleatum*. The two-way ANOVA demonstrated that the decrease due to consumption of yogurt was significant (P-value = 0.03539) compared to the control.

**Keywords:** *Fusobacterium nucleatum*, Prophylactic effect, probiotics.

Introduction

Periodontal diseases are closely related to the activity of bacteria that are present in the mouth (Socransky 1970), including species such as *Streptococcus mutans* that serve as odontopathogens (Loesche 1986). The production of insoluble extracellular polysaccharides from sucrose by *S. mutans* has been considered a virulence factor as it allows other disease causing bacteria, including *Fusobacterium nucleatum*, to colonize and promote the coaggregation of pathogenic species such as *Streptococcus intermedius, Treponema denticola* and *Eikenella corroden* (Gibbons &Nygaard 1968, Bradshaw et al. 1998, Sbordone & Bortolaia 2003, Kreth et al. 2008). Periodontal disease is exacerbated by the presence of these secondary colonizers (Kolenbrander et al.1995). In addition to its coaggregation effects *F. nucleatum* produces hydrogen sulfide, which has the ability to arrest proliferation and kill periodontal cells,
which leads to further damage of oral tissue (Han 2000, Henderson 2002, Yoshida et al. 2010).

Probiotics are live microbial food ingredients that can benefit consumer health when ingested in sufficient quantities (de Vrese & Schrezenmeir 2008). Studies investigating the relationship between probiotics and oral health are relatively new (Soderling et al. 2011). Yogurt is a probiotic product that contains *Lactobacillus acidophilus*, which produces beneficial bioactive molecules that protect against enterohemorrhagic *Escherichia coli* (Zeinhom et al. 2012) and other oral pathogens (Bhushan & Chachra 2010, Bosch et al. 2012). Recent studies have demonstrated the effectiveness of yogurt probiotics on limiting the growth of periodontal pathogens *in vitro* (Zhu et al. 2010). The purpose of this research was to determine the prophylactic effect of yogurt against the growth of *F. nucleatum* in the mouth.

**Materials and Methods**

**Experimental procedure.**

Six volunteers between the ages of 20 and 30 were recruited from the student population of Brigham Young University-Hawaii for this study. The oral microbial flora of each volunteer was sampled once per day for 14 days before lunch. The volunteers were asked to chew a small piece of paraffin (10 x 10 x 5 mm) for three minutes, moving it from one side of the mouth to the other and to expectorate into a sterile 15 mL centrifuge tube. No changes in diet were made for
the first seven days. After a baseline had been established each participant was asked to consume 170 g of plain yogurt after breakfast every day for seven days.

Immediately after sampling, saliva samples were mixed by vortexing for 30 seconds to disperse the bacteria. Samples were then spread plated, using a 10-fold dilution series, onto Crystal-Violet Erythromycin (CVE) agar media (Walker et al 1979) to select for *Fusobacterium* species. Plates were incubated for two days at 37°C; colonies were counted.

**Data analysis.**

A baseline was determined for each volunteer by averaging the counts during the first week and then compared with the averaged results for the second week. Significance was measured using two-way ANOVA without replication.

**Results**

The average numbers of *F. nucleatum* for the first week without daily yogurt consumption and for the second week with daily yogurt consumption were compared (Figure 1). The numbers of *F. nucleatum* were observed to decrease for each subject with an average overall decrease of 33.6 ± 23.4%. The two-way ANOVA without replication found statistical significance due to the treatment (P-value = 0.03539).
Discussion

This study demonstrates that daily consumption of yogurt significantly reduces the numbers of *F. nucleatum* in the mouth suggesting that yogurt may have a prophylactic effect against periodontal diseases. The wide standard deviation observed in this study demonstrated considerable variation in personal oral hygiene and diet. The use of probiotics such as yogurt may have an important role to play in maintaining oral health.

**Figure 1:** The average numbers of *F. nucleatum* colony forming units (CFU) for each subject before and after the consumption of yogurt.
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References


