

Xylitol Dentifrice Effects on Oral Salivary Streptococcus Mutans in Children

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BACKGROUND

Dental caries is the single most common chronic childhood disease; it is five times more common than asthma, four times more common than early childhood obesity, and 20 times more common than diabetes, despite the fact that today it is known to be almost totally preventable.^{1,2,3} Xylitol inhibits the growth and metabolism of several bacterial species, but among the oral bacteria, the *S. mutans* appear to be the target organism of xylitol.⁸ It is known to inhibit growth, metabolism, as well as polysaccharide production of mutans streptococci and is practically non-fermentable by oral bacteria.⁸ Xylitol promotes mineralization of the enamel structure by increasing the flow of saliva, an effect it has in common with all sweeteners, gums, or anything that is placed in the mouth.⁸

MATERIALS AND METHODS

In this cohort study, healthy subjects, ages 8-12 years, were asked to participate in the study before their recall appointment. Following consent and assignment of a subject number, the patient and parent were given instructions for the following 90 days. The caregiver of the minor subject received one tube of the Yum Yum Bubblegum™ Branam Kids Xylitol dentifrice and the patient was instructed on the proper brushing technique, frequency (2 times a day for 2 minutes), amount of dentifrice to be used, and to use the Yum Yum Bubblegum™ Branam Kids Xylitol dentifrice exclusively.

After consent and instructions (time zero), the subject provided, a non-stimulated saliva sample in a 10mL medicine cup. Each container was labeled with a unique identifier and immediately following collection of the saliva sample, the entire agar surface of the Ivoclar Vivadent CRT™ agar carrier was inoculated with two drops of saliva using a calibrated pipette. The agar carriers were then tightly secured in their corresponding vial with a NaHCO₃ tablet in an upright position and incubated at 37°C for 48-72 hours in a CRT incubator. Following 48-72 hours of incubation, the test vial was removed from the incubator. The agar was then examined to determine if the colony count was going to be greater or less than 1,000. Agar carriers with colony counts greater than 1,000 units were divided evenly into 32 sections. Averages of any 4 selected squares were then multiplied by 32 to give the estimated colony count. Agar carriers with less than 1,000 colony forming units, were either divided into 8 even sections, or not divided into any sections, if able to be quantified without divisions. The total CFU/mL was calculated as follows: CFU/mL = Estimated Colony Count divided by 0.1ml (2 Drops).

Following 90 days or 180 brushings, 24 of the 64 subjects returned to the study site to have another saliva sample collected, incubated, quantified, and recorded in the same manner as previously described (time 1). For confirmation of the amount of dentifrice used, patients were asked to bring the tube of dentifrice with them to the 90 day

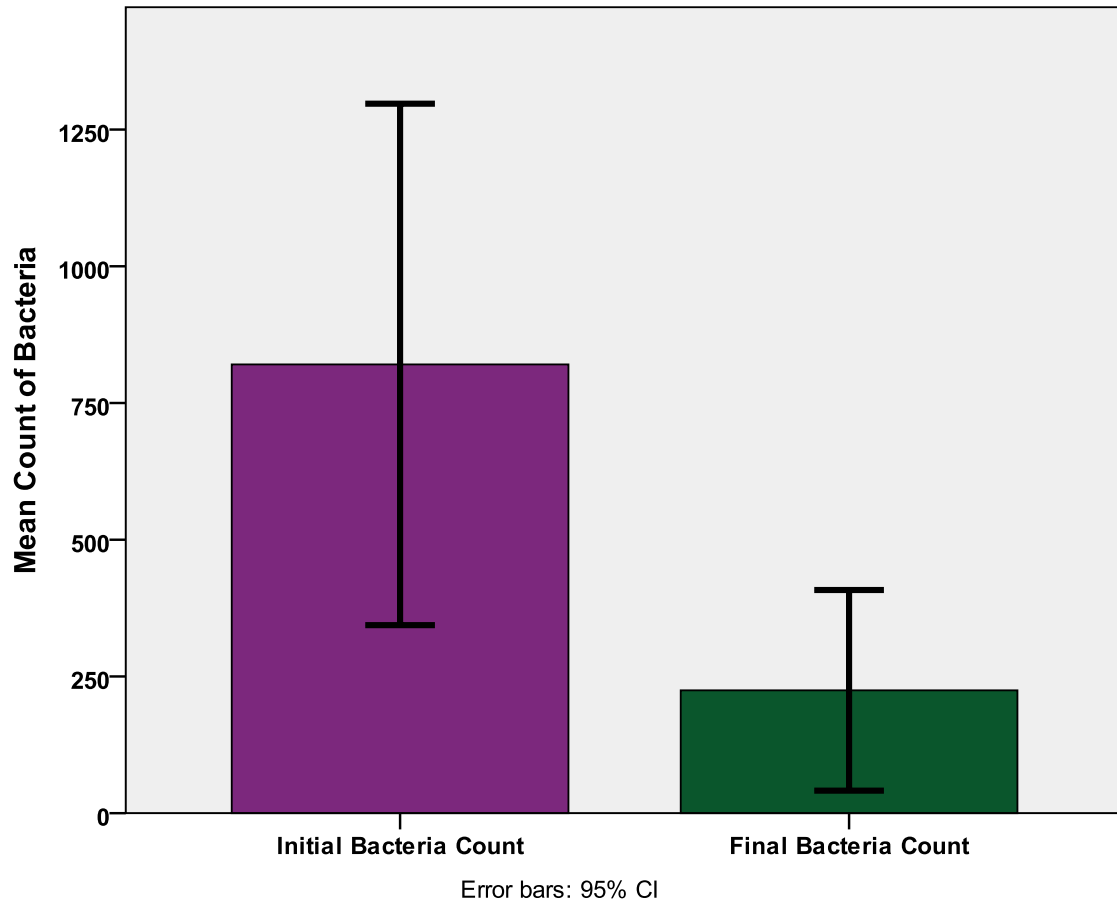
appointment to be weighed. The tube at that time was weighed and returned to the patient. Calculations were performed as follows to determine the amount of dentifrice used: 155 g (Full Tube and dentifrice inside) – (weight of tube and dentifrice returned) = amount of toothpaste used. All samples had a unique numerical code which connected the sample with the corresponding subject. Only after the study was complete were the numerical codes and subjects matched with their colony counts.

RESULTS

Originally the number of participants enrolled (T_0) was 64. Due to the inability to contact patients and patients choosing not to participate for follow up, only 24 subjects returned for the 90 day (T_1) procedure. The mean age of those patients who returned was 9.52 years and the mean age of those patients who did not return was slightly higher at 9.97 years. Independent Samples Test revealed that there was no significant difference in age of those patients who returned for the 90 day follow up sampling and those who did not return. Also, there was no significant correlation between the bacteria count difference and the amount of toothpaste used (refer to Table 3). The difference in bacteria count could have been significant when little toothpaste was used. Also the reverse could be true; the difference in bacteria count could have been little while a whole tube of toothpaste was used. This is not concerning though, for two reasons. First, the subjects with very high bacteria counts may only need a small amount of xylitol to make a difference while the subjects with very low bacteria counts, say 5, needed an entire tube of toothpaste to get their bacteria count even lower, to say, 4. Secondly, and most importantly, statistical analysis revealed a significant difference ($p < 0.05$) between the initial bacterial count and the bacterial count after 90 days of using the xylitol dentifrice (refer to Table 1). **The mean bacterial count decreased from 820 to 224 CFUs after 90 days, resulting in a 72% decrease on average.**

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Initial Bacteria Count – Final Bacteria Count	595.9	1270	259.1	59.74	1132	2.299	23	0.031

Table 1. Initial Bacteria Count vs. Final Bacteria Count T-test analysis



DISCUSSION

Based on these preliminary findings, it appears that a xylitol dentifrice can significantly reduce *Streptococcus mutans* in the oral cavity with 90 days of use. Previous studies on xylitol chewing gum resulted in a recommendation of 3-8g of xylitol per day for therapeutic effects. There were no studies included in the resources for which the guidelines indicating 3-8g per day of xylitol was based in which xylitol was delivered in toothpaste. The results of this study indicate that 0.42g of xylitol per day delivered in a toothpaste has a significant effect in reducing oral streptococcus mutans.