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SHORT COMMUNICATION

Decline in salivary *S. mutans* levels in children who have received short-term antibiotic therapy

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Introduction

It is now well established that *Streptococcus mutans* (mutans streptococci) plays a central role in the initiation and progression of dental caries (Loesche 1986a). In 1946 McClure and Hewitt showed the first evidence that experimentally induced dental caries in the rat could be inhibited by the administration of penicillin to drinking water or diet. In vitro studies have shown that *S. mutans* is susceptible to penicillin, ampicillin, erythromycin, cepatholin, and methicillin (Ferretti and Ward 1976; Weld and Sandham 1976), and long term antibiotic therapy indicates that this microorganism does not become antibiotic resistant (Baker and Thornberry 1974; Weld and Sandham 1974).

Children receiving long term antibiotics for treatment of chronic respiratory disease, rheumatic fever, or immune deficiencies show a shift in oral flora from predominantly gram positive to gram negative microorganisms. Additionally, these children reportedly have 30–70% fewer carious lesions than nontreated cohorts (Littleton and White 1964; Handelman et al. 1966; Robertson et al. 1978).

A similar reduction in *S. mutans* or dental caries has been reported in those individuals exposed to antibiotics sporadically or for short term therapy. Children with a history of either a single or episodic short-term exposure to tetracycline which resulted in tooth discoloration showed a significantly lower caries score in comparison to control dentitions (Brearly and Porteous 1973). An association between decreased caries scores and increased antibiotic use in 495 children between the ages of 6 and 7 has been orally reported (Loesche et al. 1982). However, only a short-term (less than 21 day) suppression of *S. mutans* was noted in adults receiving antibiotics for 10 days (Maltz and Zickert 1982).

Thus antibiotic therapy has been considered as a contributing factor in reducing dental caries; however, extensive data correlating short-term antibiotic therapy and a decline in dental caries or cariogenic microorganisms is lacking and contradictory. The purpose of the present study was to further examine whether the often prescribed short-term antibiotic therapy for the treatment of common acute infections in children affects the level of salivary *S. mutans* over a three month period.

Materials and Methods

Twenty-two children, between the ages of 2 and 6 years (mean 3.4), who presented to a pediatrician's office in Farmington, CT for the treatment of acute bacterial infections were the subjects of this study. Children were excluded from the study if they had received antibiotic therapy within the last three months, or were receiving any other antimicrobial agents concurrent with the study period. The presenting patients had symptoms of otitis media, sinusitis, and bronchitis and were placed on 10-day antibiotic regimens which included Augmentin®, Amoxil®, Bactrin® or Ceclor®. The subjects were sampled for salivary *S. mutans* prior to beginning the antibiotic regimen, at 2 weeks (3 days after completion of the antibiotic regimen) and at 12 weeks. Two subjects who had initially high levels of *S. mutans* were also recultured at 14 weeks.

S. mutans sampling was accomplished by having the child moisten a sterile tongue blade with unstimulated saliva. The tongue blade was then impressed onto *S. mutans* selective media contained in Rodac plates (Becton Dickinson Labware, Lincoln Park, NJ). The innoculated plates were then incubated at 35°C in plastic bags inflated with expired air to enhance CO_2. (Kohler and Bratthall 1979). After 2 days, the number of *S. mutans* were counted and recorded semiquantitatively as "0" (no detectable colony forming units), "1" (1 –9 CFU), "2" (10–100 CFU), and "3" (greater than 100 CFU). The change in subjects' *S. mutans* levels from "before antibiotics" to 2 weeks, and from "before antibiotics" to 12 weeks were compared with the Wilcoxon sign ranks test.

Results

Before antibiotic therapy 10 subjects had no detectable *S. mutans*, 9 subjects had counts between 1–9 CFU, 1 subject had a count between 10–100 CFU, and 2 subjects had counts over 100 CFU. Immediately after antibiotic therapy (2 weeks from the baseline reading) there was a significant ($P = .008$) decline in *S. mutans* levels, with 20 subjects having no detectable *S. mutans*, and only 2 subjects having counts between 10–100 CFU. After 12 weeks the subjects' counts remained significantly reduced from the pretreatment level ($P = .002$) with 19 subjects having no detectable *S. mutans* and three subjects with low counts (Table and Fig). The two children with high counts before antibiotic therapy were sampled again at 14 weeks, and their counts remained the same as those seen at 12 weeks.

Of interest are the findings from the two children who started the study with *S. mutans* counts over 100. Both of these children reportedly had a night time bottle habit at the start of the study. One child stopped bottle feeding approximately 8–10 weeks after antibiotic treatment, and the other continued bottle feeding throughout the course of the study. Both children showed a reduction to moderate *S. mutans* levels at the two-week sampling. The child who discontinued bottle feeding dropped to a low count at 12 weeks, while the child who continued bottle feeding dropped to a zero count. These results do not correlate with what would be expected from a subject's dietary changes.

Table. Levels of salivary S. mutans in children before antibiotic administration, and 2 and 12 weeks after antibiotics initiated

Subject No.	*Age*	*Diagnosis*	*Antibiotic*	*Before*	*2 Week**	*12 Week**
1	2	otitis media	Augmentin	0	0	0
2	5	bronchitis	Amoxil	1	0	0
3	2	otitis media	Bactrin	2	0	1
4	2	otitis media	Amoxil	1	0	0
5	5	otitis media	Augmentin	0	0	0
6	2	otitis media	Amoxil	3	2	1
7	2	sinusitis	Ceclor	0	0	0
8	5	otitis media	Amoxil	0	0	0
9	3	otitis media	Amoxil	1	0	0
10	4	otitis media	Amoxil	0	0	0
11	6	otitis media	Amoxil	1	0	0
12	3	otitis media	Amoxil	0	0	0
13	4	otitis media	Amoxil	1	0	1
14	2	bronchitis	Bactrin	3	2	0
15	2	bronchitis	Amoxil	0	0	0
16	3	otitis media	Amoxil	1	0	0
17	2	otitis media	Amoxil	1	0	0
18	5	otitis media	Augmentin	0	0	0
19	3	otitis media	Amoxil	1	0	0
20	4	otitis media	Amoxil	0	0	0
21	5	bronchitis	Amoxil	0	0	0
22	4	otitis media	Amoxil	1	0	0

*0 = no detectable CFU; 1 = 1-9 CFU; 2 = 10-100 CFU; 3 = >100 CFU.

Discussion

The present study suggests that short term antibiotic therapy in children reduces the levels of salivary *S. mutans* for a period of at least 3 months. These findings agree, in general, with other studies that have examined the effects of antibiotics on the oral flora or caries in man (Littleton and White 1964; Handelman et al. 1966; Brearly and Porteous 1973; Robertson et al. 1978; and Loesche et al. 1982). However, in the one study designed similarly to the present one, short term antibiotic therapy in adults suppressed the levels of salivary *S. mutans* for less than 21 days (Maltz and Zickert 1982). It is not known whether the differences between the present study and those of Maltz and Zickert could be explained by the propositions that a more established microflora in adults may be less altered by antimicrobial therapy than that in children, or that children generally receive oral suspensions of antibiotics which could have a topical as well as systemic effect in the oral cavity.

Since the decline in dental caries in many countries cannot be completely explained by the usage of fluoride, better oral hygiene practices, or dietary changes (DePaola et al. 1982), frequent use of short term antibiotic therapy has also been suggested as factor affecting the levels of salivary *S. mutans* in children and subsequently caries activity (Loesche 1986b). The present finding showing a reduction in salivary *S. mutans* following one exposure to a short term antibiotic regimen suggests that antibiotics used to

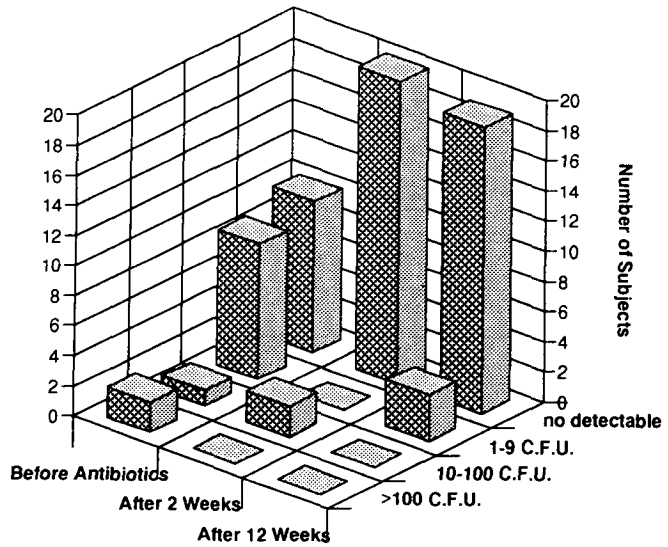

Figure. Levels of salivary S. mutans in children before antibiotic administration, and 2 and 12 weeks after antibiotics.

treat children for acute infections may have an impact on the cariogenic flora. Further studies are indicated to confirm these findings and to determine if children who have received short-term antibiotic therapy have a reduction of cariogenic microorganisms of sufficient time to diminish caries activity.

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Beginning on September 1, 1991, Pediatric Dentistry will change from the Harvard reference style (with partial references embedded in the text) to a numbered system. In the numbered system, the first reference within the text is listed as number 1, the second as number 2, etc. See samples below:

In text...

Bixler[1] stated that...

In reference list...

1. Bixler D: Genetic aspects of dental anomalies, in Dentistry for the Child and Adolescent, 5th ed. McDonald RE, Avery DR eds. Philadelphia: CV Mosby Co, 1987, pp 90–116.

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