

USE OF A BACITRACIN MOUTHWASH IN DENTAL CARIES CONTROL

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TOPICAL fluoride applications have an effectiveness in inhibiting new dental caries that can be readily demonstrated (1-4). However, the topical technique has the major disadvantage of requiring substantial amounts of professional time for making the necessary applications. As a result the procedure is costly as a public health measure and not widely used by private dentists. The continuing search for a simplified and less costly dental caries preventive technique has led to consideration of other procedures and other solutions.

A new method and another substance were suggested by studies of the effectiveness of a number of antibiotics in controlling oral lactobacilli (5-7) and in inhibiting dental caries (6,8). Penicillin and bacitracin were found equally effective in curbing dental decay in rats in an investigation in which antibiotics were

mixed with selected decay-producing dietaries. The favorable results of these studies suggested the application of one of these antibiotics as a dental caries preventive in humans. Since the use of penicillin for this purpose is contraindicated because some individuals may develop sensitivity, bacitracin was the antibiotic of choice.

In an exploratory study conducted among school children in Spotsylvania County, Va., in 1954-55, the relative efficacy of once daily use of mouthwashes of 100 ppm sodium fluoride by one group, 100 ppm sodium silicofluoride by another, and 250 units of zinc bacitracin per ounce by a third group was tested and compared with findings of a control group using a solution of 100 ppm sodium chloride and a second control group who used no mouthwash. The negative findings of this study led to the conclusion that the antibiotic solution was not concentrated enough and the applications were not frequent enough to provide an effective anti-carries procedure. Furthermore, the fluoride solutions as applied in this study did not provide significant caries control.

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Dr. R. J. Fitzgerald, National Institute of Dental Research, and Dr. John A. Scigliano, then chief, Pharmaceutical Development Service, Clinical Center, National Institutes of Health, Public Health Service, gave technical assistance in planning for the use of bacitracin and in formulating and directing preparation of the solution. Ervin Bellack, Division of Dental Public Health and Resources, prepared the fluoride solutions, and Commercial Solvents Corporation, Terre Haute, Ind., advised on formulation of the bacitracin used and supplied a portion of the chemical.

Study Procedure

To determine the merit of increasing the concentration and the frequency of application of bacitracin, in 1955-56 a second study was conducted in the elementary schools of Orange and Culpeper, two small communities in the northern part of Virginia. The children in each community who were to be included in the study were divided by classroom into two groups—a study group, which used a bacitracin mouthwash, and a control group, which used a saline mouthwash. Parental approval was obtained prior to participation in the study. In

Table 1. Number of children in study groups,¹ by age and community, bacitracin mouthwash study, Orange and Culpeper, Va., 1955-56

Age (years)	Orange ²	Culpeper ³
6-----	24	40
7-----	29	37
8-----	22	56
9-----	24	30
10-----	27	38
11-----	18	41
12-----	23	30
13-----	9	5
14-----	3	-----
Total-----	179	277

¹ Equal numbers in control groups. Total participants in study and control groups combined: Orange, 358; Culpeper, 554.

² Mouthwash used twice daily.

³ Mouthwash used once daily.

Orange, the mouthwashes were used twice daily and in Culpeper, once daily. The age distribution of the participants in the study is shown in table 1.

All children in the two schools were examined by one of two dentists at the start of the school year. Reexaminations were conducted 8 months later, at the close of the investigation. For each child, the examiners recorded the number of decayed, missing, and filled (DMF) teeth. Dental examinations were made with mouth mirror and explorer in natural light.

The oral examinations at the beginning of the study indicated that within each community the prevalence of dental caries and the percentage of caries-immune children were approximately the same for the study and control groups (table 2). The average DMF prevalence rate was higher in Orange than in Culpeper, due largely to differences in the age distribution of the children.

In Orange the children used $\frac{3}{4}$ ounce of mouthwash within $\frac{1}{2}$ hour after their arrival for the morning session and an equal quantity after the lunch period. In Culpeper mouth washing was done only once daily, in the morning. In all instances, children retained the solution in their mouths for 1 minute. Ninety percent of the children in Orange used the mouthwashes for 140-154 days. In Culpeper, 55 percent followed the procedure for the same

period and an additional 40 percent, for 125-139 days.

The solution prepared for use of the children in the study group contained 750 units of zinc bacitracin per ounce. In the formula used by the control groups, an equivalent weight of sodium chloride was substituted for bacitracin, resulting in approximately 8 mg. of sodium chloride per ounce of solution. All other ingredients of the mouthwashes used by study and control groups were the same. Both mouthwashes tasted the same, and the children did not know which they used.

A dental hygienist was assigned to the project to give all children a dental prophylaxis at the beginning of the study. Her duties also included preparation of fresh mouthwash solutions and distribution of these to the schools as required, training teachers to conduct the daily routine, checking classroom procedures, and lecturing to parents and teachers on proper toothbrushing procedures and care of children's teeth.

Findings

The beginning dental caries prevalence and the proportion of children with DMF teeth in the study and control groups are compared in

Table 2. Dental caries prevalence in the initial examination and increment during the study year, by community, bacitracin mouthwash study, Orange and Culpeper, Va., 1955-56

Community and group	DMF ¹ teeth per child		Percent of children with DMF ¹ teeth	
	At initial examination	Increment during study period	At initial examination	Increment during study period
Orange:				
Study group-----	3. 11	0. 64	72. 1	8. 3
Control group-----	3. 25	. 69	67. 6	11. 2
Culpeper:				
Study group-----	2. 55	. 69	67. 1	10. 9
Control group-----	2. 38	. 65	66. 4	7. 2
Both communities:				
Study group-----	2. 77	. 67	69. 1	9. 8
Control group-----	2. 72	. 67	66. 9	8. 8

¹ Decayed, missing, and filled teeth.

table 2, as are incremental figures for the study period.

None of the differences in dental caries incidence between study and control groups were statistically significant, whether the mouthwash was used once or twice daily. At the 5 percent level of significance, differences as large as those observed could have occurred by chance. Thus, the findings obtained in this study indicate that bacitracin when used in accordance with the procedures herein described does not inhibit the development of dental caries in children.

These findings do not rule out the possibility that bacitracin may effectively reduce dental caries if the concentration were further increased or if the antibiotic solution were retained in the mouth for a longer time period.

Summary

A study of the dental caries inhibiting effect of bacitracin mouthwash used by 456 children as compared with the effect of a placebo mouthwash used by an equal number of children indicates the following:

1. Children in the study and control groups experienced an almost similar average increment of carious teeth during the 8-month study period.

2. Use of a mouthwash containing 750 units of zinc bacitracin per ounce was no more effective when used twice daily than when used once daily.

3. None of the differences between dental caries incidence for the paired study and control groups were so large that their occurrence may not have been due to chance.

4. No evidence was obtained to indicate that

bacitracin used as a mouthwash inhibits the occurrence of caries in children. These findings do not obviate the possibility that a more concentrated solution or more prolonged use of bacitracin might be an effective dental caries preventive.

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