

A 20 percent reduction in the incidence of caries was obtained from one application of an 8 percent stannous fluoride solution.

Stannous Fluoride Clinical Study in Olmsted County, Minnesota

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RESearchers have shown that stannous fluoride applied topically reduces dental caries (1, 2), and some of their studies have demonstrated that an 8 percent solution of stannous fluoride is superior to a 2 percent solution of sodium fluoride (3).

To provide further information on the value of stannous fluoride as a caries inhibitor, we selected all 7th and 8th grade students in the rural and village schools of Olmsted County, Minn., for our study. This group was the most accessible and also had the greatest number of permanent teeth. Of those eligible, 510 (95 percent), between the ages of 12 and 13, signed up for the study with permission from their parents or guardians.

The Rochester-Olmsted County Public Health Center was chosen as the examining and experimental site because the personnel in its health unit were interested and because its facilities were available. The study was planned to cover 2 years.

Cooperation was then obtained from groups involved or interested in the study: the Roches-

ter Board of Public Health and Welfare, the Olmsted County Board of Health, the Rochester Dental Society, rural and village school officials (including the county superintendent), parents (through the PTA), and teachers (at a teachers' institute). The teachers, who interpreted the facts of the study to students and parents, were indoctrinated at the institute, in an article in their newsletter, and by means of radio, television, and news releases. The county's public health nurses also aided in this respect. All contacts were made during the summer months before schools opened.

Planning Committee

A planning committee composed of a health officer and the health educator of the Rochester-Olmsted County Health Unit, the staff of the Minnesota Department of Health Section on Dental Health, and public health nurses outlined a schedule of 50 examinations per half day. The scheduling was based on a school day which consists of 6 hours. This allowed approximately 3.6 minutes for each dental examination and the same time for the four X-rays taken by another public health dentist.

Since the students came from rural and village schools outside the city of Rochester, arrangements were made to transport them to the health center at specified times. Public health nurses informed all rural and village schools of the timetable and the means by which the

Dr. Jordan is chief, and Dr. Snyder is assistant chief, section of dental health, Minnesota Department of Health. Dr. Wilson is health officer for the Rochester-Olmsted County Health Unit. This study was sponsored by the section of dental health and the health unit and aided by a grant from the Public Health Service.

children were to be transported. Teachers were also helpful here. In rural areas, parents provided transportation for the students; in the villages, school buses were used.

Education

Since approximately 50 students were to be brought into the health center at a particular time and remain there for half a day, the health educator planned dental health classes for them. The students were divided into three groups, each designated by colored molars pinned to dresses and jackets, and while some students were passing through dental offices for X-rays and examinations, others were being rotated through classes on dental health, nutrition, and sanitation.

Following is a brief summary of the material presented in those classes:

- **Dental Health.** The objective of this class was to increase the students' interest in the proper care of their teeth. Class instruction included a review of the anatomy and general structure of teeth and emphasized the importance of having and maintaining good teeth. Theories and causes of dental caries were discussed along with the means by which tooth

decay may be prevented and controlled. Proper toothbrushing, selective diet, fluoridated water or topical application of fluorides, plus the most important factor, regular dental visits, were stressed as the principal factors in good dental health.

- **Nutrition.** The objective was to develop a favorable attitude toward a nutritionally balanced diet and an understanding of the kind and quantity of foods necessary for dental health. The nutritionist demonstrated with prepared meals the seven basic food groups (see illustrations) and pointed up the value of a good breakfast. Students were taught to select as afternoon snacks such foods as fresh fruits, fruit juices, carrot sticks, celery, and milk that leave the mouth quickly and are less cariogenic than sweets, which are normally eaten.

- **Sanitation.** Sanitarians showed tests of contaminated water supplies and explained how such supplies become contaminated. The importance of pasteurizing milk was presented. Other sanitation services that were described included restaurant inspection, nuisance abatement, mosquito control, and laws pertaining to offensive trades, such as the operation of slaughter houses.



The health educator used this dental display in summarizing proper toothbrushing, selective diet, fluoridated water or topical application of fluorides, and regular dental visits as the principal factors in good dental health.



Practical help in setting up eating patterns for a day was given students participating in the Olmsted County, Minn., stannous fluoride study.

Following an evaluation and summation of the three sessions, a dental health film, *The Gateway to Health*, was shown and discussed. The dental director briefly explained the future plans of the study and what was expected of each student.

In an effort to obviate the use of any fluoridated toothpaste by members of the control and experimental groups, a nonfluoride dentifrice was distributed among them before they returned to their schools. The students were able to obtain additional supplies from the county's public health nurses when the nurses visited the schools, or by coming directly to the health center. Records were kept on the distribution of the toothpaste.

Procedures

The students were assigned in groups of 50 per half day for examinations and X-rays. All received a complete mouth mirror and explorer examination from Dr. William A. Jordan, who used a Burton lamp to illumine mouths adequately. Two posterior bitewing X-rays and one upper and one lower X-ray of the anterior teeth were taken by another public health dentist.

In order to start this study on relatively even terms, the students were divided into two groups comparable in caries experience. The control group had a mean of 9.582 decayed, missing, or filled (DMF) teeth and a mean of 16.373 decayed, missing, or filled (DMF) sur-

Table 1. Incidence of caries after a single application of 8 percent stannous fluoride solution to erupted permanent teeth of children 12-13 years of age, at the end of 1 year

Location of new caries	Control group (N=238) ¹	Experimental group (N=234)	Difference between groups	Reduction in percent	P
Teeth.....	2. 15 ± 0. 112	1. 72 ± 0. 108	0. 43	20. 0	0. 0052
Surfaces.....	4. 79 ± 0. 229	4. 10 ± 0. 221	. 69	14. 41	. 0308

¹ Some teeth thought to be carious when first examined were subsequently found to be noncarious. The incidence of reversed diagnosis was 0.265 for the control group and 0.360 for the experimental group.

faces, as compared with means of 9.560 DMF teeth and 16.240 DMF surfaces for the experimental group. The two groups were practically identical with regard to DMF teeth and surfaces.

Following the initial examination the students were rescheduled for treatment at the rate of 12 to 14 per day, and the information was sent to their schools. Conscientious cooperation of parents in the rural areas helped keep the schedules running as planned. Cancellations or changes in time by individual students were practically nil.

The treatment began with prophylaxis by the hygienist. The teeth in one half of the mouth, upper and lower quadrant, were isolated by cotton rolls, with holders used to keep the rolls in place. A continuous roll was used on the buccal side for the upper and lower teeth. The teeth were then dried by compressed air.

During this procedure the assistant prepared a fresh solution of 8 percent stannous fluoride by dissolving 0.8 gm. of stannous fluoride in 10 cc. of distilled water.

The solution was applied to the clean, dry teeth by a cotton swab, and the teeth were kept wet for 4 minutes. A timer was used to assure uniform applications. The other half of the

mouth was then treated in the same manner. It requires approximately 30 minutes to give a good prophylaxis and a complete topical application of stannous fluoride.

The control group received prophylaxis followed by a water treatment under the same procedure as the treated group.

(An agreement was made with the parents and students of the study that if the study produced favorable results all the students in the control group would receive treatment at the end of the study if they desired.)

Followup Examination and Findings

At the end of the first year, the same public health dentist conducted a followup examination in the same manner as the original examination. Nearly as much time was devoted to planning schedules and appointments for this series as for the original series. A followup session devoted to dental health education was also planned to evaluate the first educational program.

Of the 510 students originally examined, 472 were reexamined, 238 in the control group and 234 in the experimental group. As table 1 shows, 20 percent fewer new dental caries were

Table 2. Comparison of caries in surfaces of teeth of experimental and control groups following single application of 8 percent stannous fluoride solution to erupted permanent teeth of children 12-13 years of age at the end of 1 year

Surface	Control group (N=238)	Experimental group (N=234)	Difference	Differences in percent	P
Proximal.....	2. 96 ± 0. 169	2. 35 ± 0. 143	0. 61	20. 60	0. 0052
Occlusal.....	1. 24 ± 0. 097	0. 98 ± 0. 088	. 26	20. 96	. 0478
Buccolingual.....	0. 59 ± 0. 054	0. 77 ± 0. 082	-. 18	-30. 50	. 0672

found in the experimental group than in the control group. The probability of .0052 indicates 20 percent is statistically significant. Surfaces of teeth in the experimental group were 14.1 percent less carious than in the control group.

Table 2 shows the difference in the incidence of caries between the two groups with regard to specific DMF surfaces. The proximal surfaces of the treated group were 20.6 percent less carious than the same surfaces of the untreated group. This is statistically significant. The occlusal surfaces in the treated group showed a 20.96 percent reduction as compared with the control group. The probability of .0478 is just barely significant.

There was a reverse result, inexplicable at present, in the buccolingual surfaces where 30 percent more caries were found in the experimental group than in the control group. The analysis at the end of the second year may shed some light on this situation.

In conjunction with the educational feature of the study at the followup examination, the children were given an evaluation checksheet on the subject matter presented the previous year. The children, from five different schools, answered between 70 and 75 percent of the questions correctly. Since there was no original evaluation of the education on dental health, nutrition, and sanitation, no comparisons could be made.

Summary and Conclusion

An 8 percent stannous fluoride solution, applied once to erupted permanent teeth, was

tested in students aged 12 and 13 years in Olmsted County, Minn., to determine the solution's ability to inhibit caries for 1 year. The 510 students were divided into almost identical control and experimental groups. At the end of 1 year, 472 students returned for examination. Compared with the control group, the experimental group had 20 percent fewer carious new teeth and 14.5 percent fewer new carious surfaces. Proximal and occlusal surfaces benefited from the treatment.

A second application of the solution was made at the end of the first year and its effects will be studied this year.

The students were briefly schooled in dental health, nutrition, and sanitation simultaneously with the examinations at the Rochester-Olmsted County Public Health Center. One year later the children were able to answer correctly between 70 and 75 percent of the questions put to them on the subject matter taught.

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Research Fellowships in Clinical Nutrition

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Each fellowship provides \$200 monthly for the student for not more than 3 months of the nonacademic year. Grants will be awarded on the recommendation of a senior investigator, who should make written application to the Council on Foods and Nutrition, American Medical Association, 535 North Dearborn Street, Chicago 10, Ill., by December 15, 1958.