

Effect of Topical Fluorides On Teeth Matured on Fluoride-Bearing Water

By DONALD J. GALAGAN, D.D.S., M.P.H.,
and JACK R. VERMILLION, B.S., M.P.H.

EARLIER STUDIES have been concerned with the effect of topically applied fluorides on dental caries experience in the permanent teeth of children in areas with fluoride-free water supplies (1-7). These investigations demonstrated that four applications of a 2-percent solution of sodium fluoride to the teeth of children not previously exposed to fluoride reduce the incidence of new caries in sound teeth by 40 percent.

The effect of topical fluoride therapy on teeth matured on fluoride-bearing water has not been thoroughly explored. There is a single report in the literature suggesting that topically applied fluorides do not influence caries experience in such teeth (8). Therefore, a study was designed to test further the caries inhibiting effectiveness of a 2-percent sodium fluoride solution applied directly to teeth of children continuously exposed to water having an optimum concentration of fluoride.

The study was conducted in Tucson, Ariz., from January 1953 to April 1954. The water supply in the southside section of Tucson contains 0.7 p.p.m. fluoride, an optimum concentration for the particular climatic and environmental conditions existing in south central

Arizona (9, 10). In the southside section there is a fairly large school population from which to draw continuous residents with a common history of exposure to fluoride-bearing water.

The application technique developed in earlier Public Health Service studies was used in this test (11). In alternate children, teeth in the right quadrants were treated four times with a 2-percent sodium fluoride solution after an initial prophylaxis. The teeth on the opposite side were given four applications of tap water at the same sitting. In the remaining children the teeth on the left side were treated with sodium fluoride, the control teeth with tap water. The children were examined just prior to treatment, and again 1 year later. The treated quadrants were not identified during either examination.

The study group consisted of 350 continuous resident children aged 7 to 16, and equally distributed by sex and age. At the end of the 1-year period, 282 students were available for re-examination. Of these, 142 had been treated on the left side of the mouth and 140 treated on the right side. The results of this study are based on analysis of these 282 children, whose age distribution follows.

Age	Number of children	Age	Number of children
7	10	12	33
8	39	13	30
9	38	14	15
10	44	15	22
11	47	16	4

A summary of the incremental dental caries during the study year is presented in the table. Ninety-two of the 2,342 noncarious treated teeth and 101 of the 2,324 noncarious untreated teeth became carious during the year. The observed difference shows a 9 percent lower caries incidence in the treated teeth. However, this difference is within the limits of chance variation and might have occurred had the children been given no treatment at all.

The data presented here neither confirm the

Dr. Galagan is assistant chief, Division of Dental Public Health, Public Health Service, and Mr. Vermillion is dental public health representative at the San Francisco office of the Service.

Dental caries experience during the study year in fluoride-treated and untreated permanent teeth and percent less new caries experience in fluoride-treated teeth of 282 school children in Tucson, Ariz.

Mouth quadrants	Noncarious teeth, April 1953	New carious teeth, April 1954	Percent less new caries experience in treated teeth
<i>Upper jaw</i>			
Treated.....	1, 207	48	7.7
Untreated.....	1, 199	52	
<i>Lower jaw</i>			
Treated.....	1, 135	44	10.2
Untreated.....	1, 125	49	
<i>Both jaws</i>			
Treated.....	2, 342	92	8.9
Untreated.....	2, 324	101	

previous finding (8) nor indicate that topical fluoride applications are effective when used on teeth matured on fluoride-bearing water, since the 9-percent reduction demonstrated may be attributable to chance variation. Further study of greater numbers of children is indicated before any conclusions can be drawn.

An unusually large number of children are required to demonstrate significant changes in caries experience in fluoride areas where caries activity is already low and the potential for caries prevention is small. It would be possible to demonstrate statistical significance of a 9-percent incremental difference between treated and untreated teeth if it were observed in a minimum of 2,900 Tucson children. It will be difficult to determine precisely the effect of topically applied fluorides on teeth matured on fluoride-bearing water until a fairly large community has had a fluoridated water supply for 15 years or longer.

REFERENCES

- (1) Knutson, J. W., and Armstrong, W. D.: The effect of topically applied sodium fluoride on dental caries experience. Pub. Health Rep. 58: 1701-1715, Nov. 19, 1943.
- (2) Knutson, J. W., and Armstrong, W. D.: The effect of topically applied sodium fluoride on dental caries experience. II. Report of findings for second study year. Pub. Health Rep. 60: 1085-1090, Sept. 14, 1945.
- (3) Knutson, J. W., and Armstrong, W. D.: The effect of topically applied sodium fluoride on dental caries experience. III. Report of findings for the third study year. Pub. Health Rep. 61: 1683-1689, Nov. 22, 1946.
- (4) Knutson, J. W., Armstrong, W. D., and Feldman, F. M.: The effect of topically applied sodium fluoride on dental caries experience. IV. Report of findings with two, four, and six applications. Pub. Health Rep. 62: 425-430, Mar. 21, 1947.
- (5) Galagan, D. J., and Knutson, J. W.: The effect of topically applied fluorides on dental caries experience. V. Report of findings with two, four, and six applications of sodium fluoride and of lead fluoride. Pub. Health Rep. 62: 1477-1483, Oct. 10, 1947.
- (6) Galagan, D. J., and Knutson, J. W.: Effect of topically applied fluoride on dental caries experience. VI. Experiments with sodium fluoride and calcium chloride . . . Widely spaced applications . . . Use of different solution concentrations. Pub. Health Rep. 63: 1215-1221, Sept. 17, 1948.
- (7) Knutson, J. W., and Scholz, G. C.: The effect of topically applied fluorides on dental caries experience. VII. Consolidated findings for four study groups. Pub. Health Rep. 64: 1403-1410, Nov. 11, 1949.
- (8) Downs, R. A., and Pelton, W. J.: The effect of topically applied fluorides in dental caries experience on children residing in fluoride areas. J. Colorado Dent. A. 29: 7-10, December 1950.
- (9) Galagan, D. J., and Lamson, G. G.: Climate and endemic dental fluorosis. Pub. Health Rep. 68: 497-508, May 1953.
- (10) Galagan, D. J.: Climate and controlled fluoridation. J. Am. Dent. A. 47: 159-170, August 1953.
- (11) Knutson, J. W.: Sodium fluoride solutions: Technic for application to the teeth. J. Am. Dent. A. 36: 37-39, January 1948.

