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Effect of Topically Applied Stannous Chlorofluoride on the Dental Caries Experience in Children

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At the present time approximately 20 million Americans drink water with a fluorine concentration of approximately 1 ppm or above (*1*). This is nearly one-eighth of the entire population of the United States, but it is probable that at no time will the number ever be more than 50 to 60 percent of the total population. This results from the fact that approximately one-half of the population is served by rural water supplies that are too small to be safely fluoridized. Thus, from a preventive dentistry viewpoint, other effective methods of fluoride therapy must be instituted that will compare favorably with communal fluoridation. The topical application of a concentrated solution of sodium fluoride has been introduced for this purpose, and through its judicious use a reduction in dental caries by 30 to 40 percent in children has been reported (*2*), while a reduction of 50 to 60 percent in new cavities is experienced in 6-yr-old children whose teeth calcified during the period that they ingested fluoridated water (*3*).

Conservative estimates of the annual backlog of dental services are placed at more than 1 billion units per year (*4*), with the cost of dental health care per family in the United States at more than $200 a year (*1*). This comprises 15.6 percent of the nation's entire health bill. It would seem that search should be made for a more effective topical agent.

In an attempt to find a more beneficial compound for use as a topical agent, stannous chlorofluoride (*5*) was applied to the erupted teeth of approximately 800 children, ages 6 to 15 yr, in Gas City, Ind. One-half of the children were treated with a 1-percent aqueous unbuffered solution of sodium fluoride, and approximately the same number received a 4-percent stannous chlorofluoride solution. Both fluorides were applied to the teeth by cotton applicators in a manner similar to that described by Knutson (*6*). This consisted of a thorough dental prophylaxis followed immediately by the first topical fluoride application. Within a period not exceeding 10 days, three additional topical treatments were given, although only the first was preceded by a prophylaxis. The treatment consisted of keeping all surfaces of the teeth moist throughout each 4-min treatment series.

Howell examined all the children in a Mobile Dental Trailer. Excellent light, compressed air, and new dental explorers and mirrors were used. The concentrations of the fluorides used in this study were chosen so that the fluorine levels would be similar. Since an 8-percent stannous chlorofluoride solution was considered unpleasant for use by the children, a conventional 2-percent solution of sodium fluoride could not be used and still maintain equal fluorine concentrations in both solutions. All the solutions were prepared fresh each morning and noon from oxygen-free water (*7*). Approximately 1 yr after the initial fluoride applications, the children were reexamined by the same dentist. At no time did the examiner have any knowledge of which group he was examining or of the previous caries history of the children.

The results of the topical fluoride treatments are shown in Table 1. Only the children who were examined and treated at both the initial and 12-mo periods were included in computing the data. The analysis was confined to the dental caries experience in the erupted permanent teeth at the time of the first examination. The incidence of new caries in previously noncarious teeth treated with stannous chlorofluoride was reduced by about 85 percent more than the reduction in the children who received the sodium fluoride treatment. Through the use of this new fluoride, approximately the same degree of protection was obtained on surfaces in teeth that were noncarious at

Table 1. Comparison between topically applied stannous chlorofluoride and sodium fluoride on the dental caries reduction in children.

Group	No. of children	Initial examination		12 mo later		Reduction (%)	
		No. of noncarious teeth	Decayed, missing, or filled surfaces	Newly decayed, missing, or filled teeth*	Newly decayed, missing, or filled surfaces*	Teeth	Surfaces
NaF	397	5569	1869	245	281		
SnClF	394	5407	1846	32	46	86.9	83.5

* Compared with initial noncarious teeth or surfaces.

the initial examination. The children in the sodium fluoride group in this study had an average increase of 0.708 newly decayed, missing, or filled surfaces; and if this represents a reduction of approximately 40 percent in new decay, as previously reported by many other workers (*8*), then it is reasonable to suppose that a nontreated control group would have had 1.180 newly decayed, missing, or filled surfaces. Therefore, using the average increase in newly decayed, missing, or filled surfaces in the stannous chlorofluoride group (0.117), a reduction of 90 percent in dental caries is found when compared with children who did not receive fluoride therapy. These data strongly suggest that this new fluoride is superior to sodium fluoride in preventing new dental caries when used as a topical agent. Through the use of this compound, a greater reduction in dental decay may be expected for the children who do not receive the benefits of water fluoridation.

In the study begun in 1951, stannous fluoride was used as a topical agent, and children receiving it experienced greater protection than controls given sodium fluoride furnishing twice as much fluorine (*9*). This fact, together with the data reported here, suggests that the cation, tin, may influence the effectiveness of the fluorine and that additional studies should be made to find still more effective compounds.

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Reduction of Serum Lipides and Lipoproteins by Ethionine Feeding in the Dog

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A previous report from this laboratory dealt with the induction of fatty livers in rats by the administration of ethionine and related compounds (*1*). The observation of Farber and his associates (*2, 3*) that fat accumulated rapidly in the livers of fasted female rats after injection of DL-ethionine was confirmed. It was shown, in addition, that the L-isomer is also active. In order to determine the structural specificity of this action of ethionine, the following compounds were tested for their fatty-liver-inducing action: ethionine sulfoxide, S-propylhomocysteine, S-isopropylhomocysteine and S-ethylcysteine. Only ethionine sulfoxide was found active.

The effects of ethionine administration on serum lipides of the dog are described here (*4*). It is shown that, in addition to inducing fatty livers (*5*), prolonged oral administration of ethionine results in an almost complete disappearance of circulating lipides, which are restored to normal levels upon removal of ethionine from the diet.

The dogs used in this experiment had been fed a daily diet containing 30 g of lean meat and 3 g of sucrose per kilogram of body weight, 2 g of bone ash, 3 ml of fish oil containing 1200 AOAC units of vitamin D and 3000 units of vitamin A, one tablet containing a vitamin mixture (*6*) and another tablet containing a salt mixture (*7*). Along with the diet, 125 mg of DL-ethionine was fed daily in the form of a tablet. With few exceptions, the dogs ate well during the period of observation. When a dog lost appetite as a result of ethionine feeding, force-feeding was resorted to.

Low-density, serum lipoproteins were determined by ultracentrifuging according to the method of de Lalla and Gofman (*8*). High-density lipoproteins were divided into two fractions in which the concentrations of lipoproteins less dense than 1.125 (L) and 1.20

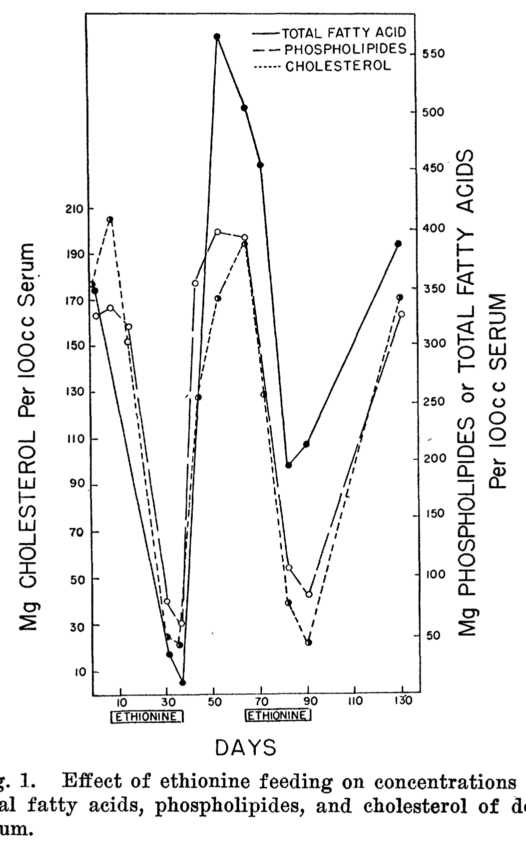

Fig. 1. Effect of ethionine feeding on concentrations of total fatty acids, phospholipides, and cholesterol of dog serum.