lesions being fewer in number and not present on areas far from the scratch. Unsensitized control animals were quite negative.

In small-scale experiments with 2 new substances, maleic and acetic anhydrides, using the same technic as with citraconic anhydride,[2] extensive immediate wheal-and-erythema reactions were produced, with subsidiary reactions in some cases. With maleic anhydride such isolated reactions appeared many centimeters from the site of scratch. It would seem profitable to examine, on a larger scale, the capacity of these compounds to produce generalized reactions.

Excellent sensitization-effects have been produced by the same method with a third substance, propionic anhydride, using patch-tests with a 25% dioxane solution. Scratch-tests, however, did not yield definite wheal-and-erythema reactions, which is interesting in view of the close chemical relationship between this compound and acetic anhydride.

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Solubility of Fluorosed Enamel and Dentine.

J. F. VOLKER.* (Introduced by H. C. Hodge.)

From the Department of Biochemistry and Pharmacology, University of Rochester School of Medicine and Dentistry, Rochester, N. Y.

The reduction of caries incidence in humans and rats ingesting fluorine may be the result of a decreased acid solubility due to the incorporation of fluorine in the dental tissues. Support for this belief is apparent in the finding of more fluorine in caries-resistant than carious enamel and dentine.[1] If this assumption is correct, we might expect the greatest reduction in acid solubility in the enamel and dentin from mottled teeth since it has been shown that these teeth contain the greatest amounts of fluorine.[2]

The acid solubility of normal and fluorosed rat teeth was studied. The upper incisor teeth were used in all cases. The fluorosed human teeth were obtained from areas where dental fluorosis is endemic and showed a mild degree of "mottling". The fluorosed rat incisors represented were of 2 grades, (1) *mild,* produced by a diet

* Carnegie Dental Fellow.

1 Armstrong, W. D., and Brekhus, P. J., *J. Dent. Res.*, 1938, **17**, 339.

2 Armstrong, W. D., and Brekhus, P. J., *J. Dent. Res.*, 1938, **17**, 27.

containing 20 p.p.m. of dietary fluorine and (2) *severe,* produced by a diet containing 300 p.p.m. of fluorine.

The teeth to be tested were powdered to pass a 100 mesh screen. Separation and purification of the enamel and dentin was accomplished by the centrifugation-flotation method.[3] Solubilities of the fluorosed and normal samples were compared by measuring the weight losses of duplicate 50 mg samples after definite time intervals in 20 cc amounts of .2 M acetic acid/sodium acetate buffer at pH 4.0.[4] Whenever sufficient amounts of the experimental materials were available, measurements were recorded at varying intervals up to and including one hour. Where the supply of experimental material was limited, quadruplicate solubility determinations were made at the end of one hour.

Results. The experimental curves for normal and fluorosed rat (300 p.p.m.) and normal human enamels and dentins may be seen in Fig. 1. Each point represents an average of 3 determinations. The solubilities of normal human and rat enamel are similar, as are those

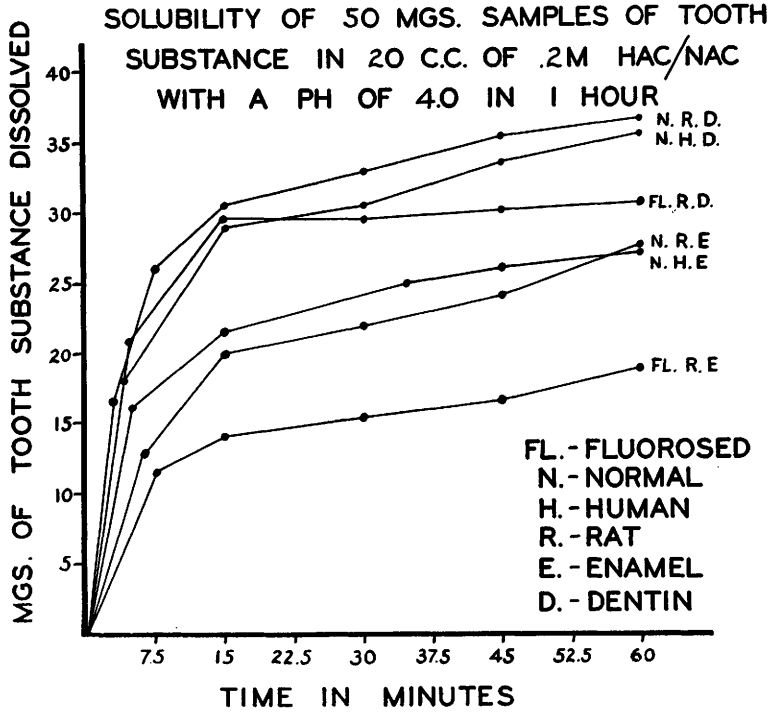

FIG. 1.

[3] Manly, R. S., and Hodge, H. C., *J. Dent. Res.,* 1939, **18**, 133.

[4] Volker, J., Thesis, University of Rochester, Rochester, N. Y., 1939.

of normal human and rat dentin. In each case the dentin is considerably more soluble than the enamel. Severely fluorosed rat (300 p.p.m) enamel and dentin have significantly reduced acid solubilities. Both the enamel and dentin solubility values of the mildly fluorosed rat (20 p.p.m.) tissues are comparable to those found in the control tissues (27.1 mg of enamel and 37.8 mg of dentin being lost in one hour). The weight loss of the mildly fluorosed human enamel samples for a one-hour period (26.9 mg) closely approximates that of the normal human enamel (26.6 mg), but the fluorosed human dentin shows a decreased solubility (32.1 mg) when compared with normal human dentin (37.8).

Comment. The findings indicate that the fluorine content of the tooth modifies its solubility. This is not surprising since the presence of fluoride decreases the solubility of related calcium phosphate.[5] Fluorosed rat enamel (300 p.p.m.) containing .125% fluorine was less soluble than normal rat enamel containing .008% fluorine.[6] Parallels are also noted with fluorosed rat dentin (300 p.p.m.) having .25% fluorine and normal rat dentin having only .01% fluorine and with fluorosed human dentin having .07%[7] fluorine and normal human dentin having only .017% fluorine.[2] The inability to demonstrate any reduction in solubility of mildly fluorosed human enamel and rat enamel and dentin (20 p.p.m.) may be explained by the low fluorine content of these tissues.

Conclusion. The presence of fluorine in large amounts may decrease the solubility of the dental hard tissues. Small amounts of fluorine show no demonstrable reduction in enamel solubility. It seems doubtful that the amounts of fluorine present in slightly fluorosed teeth is sufficient to alter their acid solubility.

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[5] MacIntire, W. H., anad Hammond, J. W., *Ind. and Eng. Chem.*, 1930, **30**, 160.

[6] Hodge, H. C., Luce-Clausen, E. M., and Brown, E. F., *J. Nutrition*, 1939, **17**, 333.

[7] Bowes, J. H., and Murry, M. M., *Brit. Dent. J.*, 1936, **60**, 556.