

Fluoride Uptake Comparison of Marketed German Anti-Cavity Toothpastes

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SUMMARY SENTENCE

An *in vitro* fluoride uptake study was run on a number of leading dentifrices marketed in Germany to assess the relative fluoridating efficiency of sodium fluoride (NaF), sodium monofluorophosphate (SMFP), and amine fluoride (AmF) systems.

BACKGROUND

Our laboratory routinely conducts analyses of marketed fluoride toothpastes in order to compare the relative fluoridating efficiency of the various formulations that are available for sale to the public. These analyses are done on a global basis. Often a dental researcher from the country whose products we are assessing will come to Cincinnati to be trained in the *in vitro* method and will then perform the testing himself/herself.

One such study was run recently (May, 1995) on some of the leading dentifrice brands sold in Germany. We were particularly interested in the relative fluoridating efficiency of the blend-a-med[®] (NaF) anti-cavity products vs. the Elmex[®] (AmF) products. Amine fluoride dentifrices are sold in Germany, Austria and Switzerland, and they have typically commanded the leading share of dental recommendations in these countries. Previous testing (Faller, ORCA, 1991) suggested that properly formulated NaF and AmF dentifrices provided similar levels of fluoride uptake in this *in vitro* model. Some of the products sold in Germany also contain a NaF + SMFP mixed active system. Our previous testing of these types of products relative to our NaF Crest standard has shown that the 100% NaF dentifrices provide significantly greater fluoride uptake than the mixed active products. We sought to confirm this with the subject testing. Dr. Helga Burk, from Philipps University in Marburg, Germany performed the testing in our Cincinnati research facility.

PROTOCOL

Subsurface human enamel specimens were placed in 25ml of a solution containing 0.5M/L lactic acid, 0.2% Carbopol 907 (B.F. Goodrich Co.), 50% saturated with respect to HAP, pH 5.0 for 96 hours at 37°C. After demineralization, specimens were thoroughly rinsed, then analyzed for surface microhardness with a Leitz miniload tester at a constant load of 200g. Hardness numbers using the Vicker's scale were taken three times on each specimen, then averaged. Specimens were then placed, four to a group, in such a way that the average hardness for each group of specimens was not significantly different. After placing specimens in their respective groups of four, each group was placed in 20ml of fresh, pooled human saliva for a period of one hour to form an initial layer of pellicle on the demineralized enamel surfaces. Dentifrice slurries were prepared by thoroughly mixing 5g of dentifrice with 15g pooled, human saliva for a period of not less than 4, nor more than 5 minutes prior to use. A fresh slurry was prepared for each treatment. Treatments were made four times per day for a total of six treatment days, following the daily treatment schedule pictured below. Upon completion of pH cycling, specimens were analyzed for fluoride content, to a constant depth of 100m, using the microdrill biopsy technique. Results are reported in g of fluoride per cm² of surface sampled.

Daily Treatment Schedule:
1 hr. saliva bath (initial pellicle formed) [#]
1 min. treatment in 1:3 slurry of dentifrice:saliva [#]
1 hr. saliva bath
1 min. treatment in 1:3 slurry of dentifrice:saliva [#]
1 hr. saliva bath
3 hr. exposure to demineralization solution
1 hr. saliva bath [#]
1 min. treatment in 1:3 slurry of dentifrice:saliva [#]
1 hr. saliva bath
1 min. treatment in 1:3 slurry of dentifrice:saliva [#]
saliva bath overnight [#]
[#] indicates fresh saliva used

RESULTS

Product Tested	Fluoride Type	F-Uptake (µg/cm ²) [*]
Crest Control (1100ppm F)	NaF	28.5 ± 0.4 ^{**}
blend-a-med Plus ⁽¹⁾ (1450ppm F)	NaF	26.8 ± 5.2
Colgate Baking Soda ⁽²⁾ (1100 ppm F)	NaF	25.9 ± 5.4
Meridol ⁽³⁾ (1400ppm F)	AmF + SnF	16.3 ± 2.3
Odol Med 3 ⁽⁴⁾ (1055ppm F)	NaF + SMFP	12.9 ± 1.6
Control (250ppm F)	NaF	11.2 ± 1.0
Colgate Kariesschutz ⁽²⁾ (1000ppm F)	NaF + SMFP	10.3 ± 1.3
Elmex ⁽³⁾ (1250ppm F)	AmF	6.5 ± 1.8
Control Placebo (0ppm F)	N/A	5.4 ± 0.4

^{*} Mean ± S.D. (N=4)

^{**} Values within brackets are not significantly different (p ≤ 0.05) as determined by Least Significant Difference Analysis

(1) Manufactured by: Procter & Gamble Co.

(2) Manufactured by Colgate-Palmolive Co.

(3) Manufactured by Wybert Lorrach

(4) Manufactured by Lingner and Fischer

CONCLUSION

The German NaF dentifrices at 1100-1450ppm F provided significantly higher fluoride uptake than the NaF + SMFP dual active dentifrices. This is consistent with testing on similar products from other parts of the world. The Elmex[®] AmF dentifrice gave surprisingly low fluoride uptake in light of the 1991 testing by Faller. This prompted us to retest this Elmex[®] product, as well as some of the original Elmex[®] that had been tested in 1991.