1601 Cariostatic evaluation between APF application and fluoride dentifrice using a pH-cycling model

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Acidulated phosphate fluoride is more efficient than fluoride toothpaste regarding to fluoride uptake into enamel, however dentifrice is used more frequently. There are no data comparing the cariostatic effect of these methods considering the dynamic of caries development. To study this subject were used 36 enamel blocks (3x3mm) obtained from impacted human third molars. Fifty µm of the enamel surface was removed by polishing. Twelve blocks were used as control (Placebo Group), 12 were previously treated with APF gel (12,300 ppm F) for 04 minutes (APF Group) and 12 were treated, during the pH-cycling, with fluoride dentifrice (Kolynos Super Branco) containing 1,200 ppm F as MFP (F-Dentifrice Group). The 36 enamel blocks were submitted *in vitro* to a pH-cycling model simulating a high cariogenic challenge (Featherstone et al., 1986). The placebo and the APF groups were treated with a non-fluoride dentifrice twice/day, after the demineralizing and remineralizing cycles. The F-dentifrice group received the same treatment, but using a slurry (1:3) of the fluoride toothpaste. After the pH-cycling the enamel was analyzed in terms of: 1) Fluoride uptake; 2) Surface microhardness (SMH) and 3) Cross-sectional enamel microhardness (CSEMH). The results (mean±SE) according to the groups Placebo, APF and F-dentifrice were, respectively: 1) Fluoride uptake (ppm F): 1134.2±158.8A; 847.0±91.7B; 1802.4±218.7C, 2) Knoop SMH: 89.7±8.3A; 152.6±13.3B; 168.3±10.1C; 3) CSEMH (Knoop x µm) 16114.2±1653.2A; 28957.2±1837.6B; 25487.2±1065.5C. Means followed by different letters were statistically (Kruskal-Wallis) significant (p<0.05). The results suggest that the daily fluoride dentifrice use was more efficient to reduce the surface mineral lost than one APF application, but the APF was more efficient to reduce the subsurface lesion. (Supported by Kolynos do Brasil/UNICAMP, project 23/95)

1602 3-Year Study of Fluoride Tablet and Sealant on Dental Caries

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The purpose of this study was to observe the effects of fluoride tablet and sealant project on dental caries in a group of Chinese children. The three-year experiment was taken in Chengdu City of China where the fluoride level is less than 0.3 PPM in water. The subjects included 685 children aged 7-8 years old and were divided to three groups. One group used fluoride tablet, one used sealant. Additional sample who were not using fluoride tablets or sealant to provided a control group. The caries was examined by WHO criteria at baseline and once a year. For children who had consumed fluoride tablets for three years, there was a decrease in DMFT of 45 percent and in the mean DMFS of 56.14% percent compared to control group. For the first molar the decrease of caries was 40.54% in DMFT and 50% in DMFS. For sealant group the decrease in DMFT and DMFS of first molar was 81.08% and 86.00% respectively. Results seem to confirm the caries-reducing effects of both fluoride tablet and sealant found in previous studies. The sealant has a better effect than fluoride tablet for pit and fissile caries. Therefore combined use of both sealant and fluoride tablet will get most acceptable advancement for the prevention of dental caries in Chinese children.

1603 *In Vitro* Demineralization of Enamel Surfaces Observed by AFM.

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The suitability of atomic force microscopy (AFM) to observe the ultrastructure of enamel surfaces was published recently (Kobayashi and Uemura, 1994). Aim of the present study was to determine details of initial enamel demineralization by using AFM and ESCA. Enamel specimens (3 mm in diameter) were prepared from extracted human incisors using a hollow core drill. The surface was highly polished using the standard methods. Subsurface lesions were produced by immersion in a demineralizing solution for 0, 2, 4, 6 and 8 hours. The demineralizing solution (pH5.0) consisted of 0.1M lactic acid, 0.2% carbopol and 50% saturated hydroxyapatite. The AFM images detected DCPD crystals and crystal microinterspaces around the DCPD crystals at the enamel surface after 4-hour demineralization. The number of observed DCPD crystals and crystal microinterspaces increased at the enamel surface with increasing the demineralizing periods. The results of ESCA analysis indicated that the Ca/P atomic ratio increased at the enamel surface as compared with the control. Due to the presence of DCPD, the increase of the Ca/P atomic ratio was due to the decrease of the P contents. Based on these results, the presence of DCPD crystals and crystal microinterspaces produced at the enamel surface by an initial acid attack may be important to understand the mechanism of dental caries and could influence a following acid attack. (Kobayashi M and Uemura M. Observation of the surface of human dental enamel using an atomic force microscope and surface characterization. J Osaka Odontol Soc., 57:248-262, 1994)

1604 Effect of Remineralization on Demineralized Root Surfaces.

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Our previous work has shown the effect of fluoride not only in demineralization solutions ranging from 1ppmF to 10ppmF but in subsequent remineralization solutions at a pH of 4.5. The purpose of this study was to first evaluate the effects of different fluoride concentrations on human root surfaces demineralized at pH 4.0 with small concentrations of fluoride (0, 0.02,0.05, 0.2, 0.5, and 2ppm NaF) followed by remineralization in 1ppm, 5ppm, and 10ppm fluoride. Secondly, the root lesions were characterized in the acid buffer and acetic acid according to the mineral distribution within the lesion.
Fifty- four root surfaces were demineralized in a partially saturated buffer containing 2.2mM Ca++, 2.2mM PO4-3, 50mM HAc with NaF ranging from 0->2ppm. These lesions were sectioned, characterized, and painted and then placed into a remineralizing solution (1.5mM Ca++, 0.9mM PO4-3, 0.15M KCL with 1ppm , 5ppm and 10ppmF). The sections were photographed with polarized light microscopy and examined by microradiography both qualitatively and quantitatively after the initial demin and at 1, 3, 7, 14 and 21 days of remin.
After remin with 10ppm F the 0ppm F group showed a decrease in lesion depth of 7% with a mineral content increase of 15%. The 0.2ppmF group showed little change in the original lesion depth but a remin of 20% while the group containing the highest fluoride level (2ppmF) showed a lesion depth decrease of 19% with a mineral content increase of 37%. Lesions demineralized at pH 4.0 without fluoride or with very small concentrations of fluoride formed deep lesions which were difficult to remineralize even after at 21 days. The location of mineral deposition was on the remaining inorganic portion and not the organic matrix. The amount and location of mineral deposition may be of significance in the arrestment and treatment of *in vivo* root surface caries. Supported by P50 DE11134.

1605 Effects of Na_2SiO_3 on the fluoridization of apatite powder

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We have previously reported that $(NH_4)_2SiF_6$ effectively fluoridate hydroxyapatite (HAP) powder to fluoridated-HAP (FAP) more than acidulated phosphate fluoride (APF), even larger amount of total fluoride, *i.e.* FAP and CaF_2, was obtained when treated with APF. The aim of this investigation was to shed some light for understanding of the mechanism of effective FAP formation by $(NH_4)_2SiF_6$. Recently, silicate has been given attention due to its catalytic effect on HAP formation. Since the crystallographic structure of FAP is almost the same with HAP, silicate may catalyze FAP formation, which may play an important role in the fluoridization process of HAP by $(NH_4)_2SiF_6$. HAP powder was treated with NaF solution in the presence and absence of Na_2SiO_3 (0-20mmol/L). The pH of the solution was kept constant with a pH-stat at 7.4. Then, the fluorine contents in the form of CaF_2 and FAP were determined according to the method of Caslavska. Total fluorine content in the HAP powder decreased with an increase in silicate concentration. In the absence of silicate, however, most fluorine was incorporated in the form of CaF_2. The amount of fluorine in the form of FAP was smaller than CaF_2 regardless of the concentration of silicate, but increased with silicate concentration to reach maximum value at the concentration of 10.0 mmol/L, then decreased once again with further increase in silicate concentration. The same tendency between silicate concentration and crystallinity of the treated HAP was observed, *i.e.* highest crystallinity was obtained when silicate concentration was 10.0 mmol/L. We conclude that silicate play an important role in the formation of FAP. This study was supported in part by Grant-in-Aid for Scientific Research from the Ministry of Education, Science, Culture and Sports, Japan.(08771960)

1606 Effects of Different Commercial Dentifrices on Enamel Initial Lesion Progression.

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The objective of this study was to utilize the *in vitro* single-section technique (Wefel et al., JDR 1987;66:1485-1489) and the pH-cycling model (Heilman et al., JDR 1991;70:493) to evaluate and compare the de/remineralization effects of dentifrices manufactured locally in some developing countries. The tested dentifrices have been previously analyzed for F ion concentrations (Itthagarun and Wei, Int Dent J 1996;46:119-125), which included, Maxam DFP®, Maxam Tartar Control®, First®, Tianqui Medicated® from China; Vicco Vajradenti® from India; Colgate MFP_2®, Crest Tartar Control from USA; and one non-fluoride dentifrice as control. Sound molars were painted, leaving a 1 mm wide 'window' on the buccal and/or lingual surface and placed in the demineralization solution for 96 h to produce artificial caries lesion ≈ 80-100 µm deep. The teeth were then longitudinally sectioned (≈ 100 µm thick), and randomly divided into 8 groups (22 sections/group). The pH cycling model was utilized for 10 days. Polarized light microscopy and microradiography were used to evaluate the lesion progression before and after treatment. The control group showed an increase in lesion depth of 70% and was statistically different from some test groups which ranged from -2% to 68% (p<0.01, ANOVA and t-test). Statistically significant differences were also observed among some of the fluoride containing groups. This study suggests that, when compared to 'multinational dentifrices', some Chinese and Indian dentifrices manufactured locally failed to show the 'healing' efficacy even though they claimed to contain varying levels of F. (Supported in part by a CRCG grant, The University of Hong Kong)

1607 Gingival Inflammation in Buccal and Lingual Regions.

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The aim was to investigate the relationship between gingival inflammation in relation to the amount of dental plaque on buccal and lingual and regions. The material consisted of 2112 buccal and lingual toothsurfaces from 20 females and 20 males, mean age 42.2 (± 12.2 SD) yrs, selected after a comprehensive professional cleaning, resulting in gingival index 0 (GI 0). The participants were asked to maintain their individual oral hygiene habits during 30 days. Gingival inflammation was then measured with gingival index (GI) and the plaque area was determined as percent of tooth area covered by plaque (P%I).
At GI 0 the mean P%I for females was 14.9(±0.9 SE)% and for males 15.7(±1.9)%. At GI 1 the corresponding values were 14.3(±1.1)% and 19.7(±2.5)% respectively, (p<0.05). The difference in mean P%I between GI 0 and GI 1 was statistically significant for males (p<0.01) but not for females (p>0.05). In males, the difference in mean P%I between GI 0 (13.3±1.4)% and GI 1 (24.9±2.1)% for the mandibular buccal surfaces was significant, p<0.001. For the mandibular lingual surfaces the difference between GI 0 (17.7±1.8)% and GI 1 (25.7±2.4)% was significant, p<0.01. In the maxilla significant difference was found at GI 1 between the buccal surfaces of the molars (35.0±5.3)% region and the buccal surfaces of the incisors (12.7±1.5)% region in mean P%I, p<0.001. In conclusions, there is a difference between GI 0 and GI 1 in mean P%I in males but not in females. In males at GI 1, mean P%I varied between regions. The study was supported by the Swedish Patent Revenue Fund and Karolinska Institute, the films were provided by Kodak Company, Sweden.

1608 The Effect of Brushing Lingual Surfaces First.

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Previous studies indicate that despite greater accumulation of both hard and soft deposits and higher levels of bleeding on probing for mandibular lingual surfaces, standard toothbrushing focuses little or no time on that area. The aim of this pilot study was to evaluate the impact of directed toothbrushing on gingival bleeding and calculus accumulation for a group of private practice recall patients in the United States. A total of 126 patients in 29 general dental practices were instructed to use a dry toothbrush (using no toothpaste) and brush the lingual surfaces of the mandibular teeth first. Bleeding and calculus scores were measured on the lingual surfaces of the mandibular teeth prior to directed brushing instructions and again at their next recall visit. Recall intervals ranged from 2 to 9 months, averaging 6 months. Statistical analysis of the data was performed using SPSS statistical software. Descriptive statistics comparing differences in bleeding and calculus scores by tooth for each subject demonstrated similarities in these scores for posterior teeth versus anterior teeth. Further data analysis was then performed based on the two categories of teeth, posterior and anterior. The Wilcoxon Signed Rank test revealed a statistically significant (p<.0001) reduction in bleeding and calculus scores from the baseline visit to the follow-up visit. Both the bleeding and calculus median values for the anterior teeth were higher at baseline than those values for the posterior teeth at baseline. However, the magnitude of improvement was slightly greater in the posterior region than in the anterior region. The median bleeding value for the mandibular anterior teeth was reduced by 40% from baseline to follow-up, while the median bleeding value for the posterior teeth was reduced by 50%. A slightly greater change in calculus scores was observed. The median calculus value for the anterior teeth was reduced by 47% from baseline to follow-up, while the median calculus value for posterior teeth was reduced by 67%. Statistically significant reductions in bleeding and calculus accumulation were demonstrated in this pilot study by instructing patients to brush mandibular lingual surfaces first using a dry toothbrush.