1881 Effects of pH-Cycling On SnF_2 Reaction Products - ^{19}F-NMR [1]D J. WHITE*, [1]E.R. COX, [1]N WESTRICK, [1]Y PAN, [1]A GWYNN AND [2]J. ARENDS ([1]The Procter and Gamble Company, Cinc., OH, [2]The State University of Groningen, The Netherlands).

The purpose of this study was to identify the effects of pH cycling on reaction products produced by dentifrices & gels on hydroxyapatite. HAP powders (.75 gm) were suspended (5 min.) in 10 ml of 25 %-wt dentifrice water supernates of Crest® Gum Care [CGC](0 454 % SnF_2, silica, Na-gluconate), Crest® Regular [CR](0.243 % NaF, silica), Original Crest® SnF_2 [CO](0 454 % SnF_2, CaPyro), GelKam® [GK](0.40 % SnF_2 gel), Acid Phosphate Fluoride [APF] (1 23 % F Ion, Nupro ® APF), and Neutral Sodium Fluoride Gel [NSF] (2.0 % NaF - 0.9 % F Ion, Nupro® Neutral) Following water washing, HAP was pH cycled for 7 days in remin. [Ca = 2.5 mM, P = 1.5 mM, 150 mM KCl, 20 mM cacodylate, pH 7.3, 20 h] or demin. [lactic acid = 100 mM, 50 % HAP, pH = 5.0, 4 h] buffers. Cycled samples were freeze dried for F reaction product analysis by Magic Angle Spinning ^{19}F NMR [282.29 MHz; Bruker MSL 300; spinning 12.5 kHz; spect. width 125 kHz] Following cycling, all treated HAP still exhibited significant quantities of FAP (~ 60-64 ppm resonance vs. C_6F_6) and substantial amounts of Non-Specifically-Adsorbed-Fluoride (44 ppm resonance). SnF_2 and APF gel treated HAP also continued to exhibit significant levels of calcium fluoride - although less than immediately after treatment. The semi-quantitative estimation of CaF_2 vs. FAP reaction products was assisted by the application of a Hahn-Spin-Echo technique. HSE analysis revealed that significant transformation of CaF_2 to FAP and FHAP took place during pH cycling - e.g. In M/M_0 (M = signal intensity time τ after HSE pulse; M_0 = initial signal intensity) for fresh:cycled CGC treated HAP measured [-0.11:-0.41]; [-0 25:-0 61], [-0.33.-0 80]; [-0.41, -0.98]; [-0.45:-1.12] for τ = 0.8, 179, 361, 544, 725, 907 µsec. Reactivity of SnF_2 treatments (CGC vs. GK gel) were similar. **The conversion of F reaction products under dynamic conditions *in vivo* is an important factor to consider in the mechanism of F anti-caries action.**

1882 Prevention of early childhood caries - a fluoride toothpaste demonstration trial on Chinese children E SCHWARZ*, ECM. LO, MCM WONG (The University of Hong Kong)

The prevalence and incidence of caries in primary teeth of Chinese children is dramatic compared to present western standards. The objectives of this study were to evaluate longitudinally over 4 years the effects of introducing daily toothbrushing with fluoride toothpaste in a Chinese kindergarten (Test) compared with caries development in children who had no organized preventive programme (Control) In the test group teacher supervised toothbrushing was initiated together with health education to all children. Toothbrushes and toothpaste (1,000ppm F) were supplied. Dental treatment availability was extremely limited Test and control children were examined at baseline (n=289, age 3) and annually thereafter After three years 243 children (84%) are still in the trial (T 89%, n=149; C: 78%, n=94). Caries development (dmfs) adjusted to include only those children and surfaces which were present at both baseline and subsequent annual examinations are tabulated Additionally, multiple regression analysis indicated that both bascline dmfs and programme had significant effect on caries increment We conclude that a daily toothbrushing with limited involvement of professional staff was feasible in a Chinese kindergarten and that caries development was significantly slowed in the test children.

	Test	Control	Significance
Bascline	4 7	6.7	p = 0 04
Year 3	7.6	12 4	p = 0 01
Increment	2 9	5 7	p = 0.01

Supported by University of Hong Kong and Colgate (Guangzhou).

1883 Arresting rampant caries through daily brushing with fluoride toothpaste in Chinese kindergarten children. E.C.M LO*, E. SCHWARZ, M C M. WONG (Faculty of Dentistry, The University of Hong Kong)

Studies conducted on children in a rural county of Southern China showed alarming rates of dental caries in the primary teeth, dmfs indices ranging from 7.2 at age 3 to 14 4 at age 6 The main objectives of this study were to establish a daily toothbrushing exercise using fluoridated toothpaste (1,000 ppm F) in a kindergarten (Test) and to evaluate longitudinally over 4 years the oral health effects compared with children who had no organized preventive programme (Control) In the test group teacher supervised toothbrushing was initiated together with health education to all children Due to a lack of resources and dental personnel, restorative and other curative treatments were not provided. Although the children could seek dental care from available outlets, these were extremely limited Test and control children were examined at baseline (n=289, age 3) and annually thereafter After three years 243 children (84%) are still in the trial Rehardening of dentinal caries (arrested caries) was clinically detected more often in the test (67/121) than in the control children (33/84) among those who had active caries during the study (p=0.03). Additionally, multiple regression analysis indicated that baseline ds, oral hygiene level and the fluoride programme had significant effect on the number of carious tooth surfaces found to have arrested at the third annual examination. We conclude that daily toothbrushing with fluoridated toothpaste can promote rehardening of dentinal caries and minimize the need for curative treatment in the primary dentition of children with limited access to dental care.

This study was supported by The University of Hong Kong and Colgate (Guangzhou).

1884 Effect of Bicarbonate on Stephan Curves in a Model Plaque System. C. DAWES* (Department of Oral Biology, University of Manitoba, Winnipeg, MB, Canada, R3E 0W2).

The objective was to determine the bicarbonate concentration in the saliva/dentrifice slurry produced during use of a dentifrice high in bicarbonate and the effects of different dentifrice dilutions and equivalent bicarbonate concentrations on Stephan curves in a model plaque system (J Dent Res 70:1230-1234, 1991). Six subjects brushed for 1 min with 0.6 g of Arm & Hammer Dental Care dentrifice (AHDCD) and with Colgate Regular dentifrice (CRD). The saliva/dentrifice slurry was collected after 20, 40 and 60 s. With AHDCD the bicarbonate concentration was about 1 mol/L and about 13 mmol/L with CRD. A plaque 6 x 6 x 0.5 mm of *S. oralis* in 1% agarose was initially exposed to 10% sucrose for 1 min and then after 20 min, when the pH was about 4.5, to bicarbonate solutions or dentrifice dilutions with bicarbonate concentrations of 0 - 1 mol/L, for 1 min, followed by artificial unstimulated saliva at a salivary film velocity of 1 mm/min. Bicarbonate concentrations of 0.5 mol/L or above caused a rapid return of the plaque pH towards neutrality and by ANOVA there were no significant differences between the effects of AHDCD dilutions and sodium bicarbonate solutions of the same bicarbonate concentration. The results suggest that use of AHDCD for 1 min when plaque pH is at a minimum should result in a rapid return of the pH to neutrality. This study was supported by the Church & Dwight Co., Inc., and the Canadian MRC.

1885 *Effects of High Bicarbonate in a Dentifrice on Intraoral Demineralization.* T. YASKELL[1]*, S. KASHKET[1] and B.J. NELSON[2] ([1]Forsyth Dental Center, Boston, MA, and [2]Church & Dwight Co., Inc., Princeton, NJ, USA).

Dentifrices containing a wide range of bicarbonate concentrations are currently available to the consumer. A study was carried out to determine whether high levels of bicarbonate in a dentifrice would affect the intraoral, sucrose-induced demineralization of enamel in the Delta Ip model system. Subjects wore appliances that contained blocks of bovine enamel covered with S. mutans IB 1600 cells. Five subjects rinsed with 20% (w/w) slurries of different dentifrices for 1 min and, after 30 min, rinsed with 10% sucrose. Enamel assays and streptococcal plaque pH measurements were carried out after an additional 45 min. A F-free, high-bicarbonate preparation (i.e., F-free Dental Care, Church & Dwight, Co.) gave a delta Ip of 7.6±4.4 units, while a F-free, bicarbonate-free, silica based dentifrice gave 12.6±2 3 units ($p<0.05$), i.e., greater demineralization. Plaque pHs were 5.3±0.6 and 4.9±0.3, respectively. Results were similar when subjects waited 60 min before rinsing with the sucrose solution. A bicarbonate-free dentifrice with 1100 ppm F gave delta Ip = 4.0±2.3 units and pH = 4.9±0.3. The findings suggested that bicarbonate was retained within the plaque mass, raising the pH of the plaque and, thereby, reducing demineralization. Additional studies, without the sucrose rinses, showed that plaque pH values at 30 and 60 min were 8.4±0.1 and 7.9±0.1, respectively, and that bicarbonate levels, determined by HPLC, were relatively high in the bicarbonate-exposed plaques. It is concluded that the ability of high-bicarbonate dentifrices to maintain high plaque pH values may contribute to the anti-caries efficacy of these products. Supported by the Church and Dwight Co., Inc., Princeton, NJ.

1886 Neurocranial Growth Attenuation in X-Linked Dominant Hypophosphatemia. D.J. FERGUSON, C.A. WITEK*, W.A. ROY. (Marquette University, School of Dentistry, Milwaukee, WI, USA).

The C57BL/6J strain of mouse (Hyp) was used to analyze the influence of X-linked dominant hypophosphatemia on neurocranial growth. Sixty normal and 60 hypophosphatemic skulls were compared at six study ages (10 per group) between ages 3 and 15 weeks in order to clarify the onset, timing and magnitude of neurocranial malformation in this genetic bone condition found in man. A high resolution lateral cephalometric technique was developed utilizing a biased fractional focus tube machine with a 0.3 x 0.3 millimeter focal spot. The 87.5 inch focal spot to object distance combined with near object to film contact yielded a high resolution radiographic image at close to a 1:1 object to image ratio. Image enlargement error was computed at 0.45%. The individual cephalograms were projected at exactly ten times actual size and neurocranial landmarks were identified. The tracings were digitized for an 8 linear, 5 angular and 1 composite measurement lateral cephalometric analysis. A series of hypotheses were formulated to test for neurocranial pattern sameness BETWEEN genotypes as well as WITHIN genotypes at study ages 3, 5,7,10,13 and 15 weeks. Accumulative and incremental growth of the neurocranium was analyzed and ANOVA testing was used to determine statistically significant differences. The following may be concluded regarding the neurocranial manifestation of this bone disease as expressed in the male C57BL/6J strain of mouse: 1. Onset of the disease did not become *apparent until after the third postnatal week.* 2. *All cranial dimensions measured were diminished* in linear size ($p<0.05$) except for neurocranial height which became larger in the Hyp ($p<0.05$). 3. Although accumulated size gains were made during the 3 through 7 week periods for both control and Hyp groups ($p<0.05$), neurocranial growth rate in the Hyp during this period remained constant while growth rate in the control group deceased significantly ($p<0.01$). A cross-sectional study of 120 dried skulls revealed substantial neurocranial growth attenuation between the third and fifteenth week of life in male mice affected with X-linked dominant hypophosphatemia.

1887 Growth Attenuation of the Facial Skeleton in X-Linked Dominant Hypophosphatemia. D.J. FERGUSON*, C.A. WITEK, W.A. ROY. (Marquette University, School of Dentistry, Milwaukee, WI, USA).

The influence of X-linked dominant hypophosphatemia on growth of the facial skeleton was studied using the C57BL/6J strain of mouse (Hyp) as an experimental model. A cross-sectional study was *made of 60 normal and 60 hypophosphatemic skulls by comparing six ages (10 per group) between 3* and 15 weeks in order to clarify the onset, timing and magnitude of viscerocranium malformation in this genetic bone condition found in man. A high resolution lateral cephalometric technique was developed utilizing a biased fractional focus tube machine with a 0.3 x 0.3 millimeter focal spot. The 87.5 inch focal spot to object distance combined with near object to film contact yielded a high resolution radiographic image at close to a 1:1 object to image ratio. Image enlargement error was computed at 0.45%. The individual lateral cephalograms were projected at exactly ten times actual size and landmarks of the facial skeleton were identified. The tracings were digitized for a 7 linear, 3 angular and 1 composite measurement analysis. A series of hypotheses were formulated to test for facial skeletal pattern sameness BETWEEN genotypes as well as WITHIN genotypes at study ages 3,5,7,10,13 and 15 weeks. Accumulative and incremental growth of the viscerocranium was analyzed and ANOVA testing was used to determine statistically significant differences. The following was found regarding the manifestation of this bone disease on the facial skeleton: 1. Onset of the disease did not become apparent until after the third postnatal week. 2. All viscerocranium dimensions measured were diminished in linear size ($p<0.05$) except for posterior face height which was larger in the Hyp ($p<0.01$) *at 3 weeks, smaller at 5 weeks ($p<0.05$) and no different thereafter.* 3. *Although accumulated size* gains were made during the 3 through 7 week periods for both control and Hyp groups ($p<0.01$), viscerocranium growth rate in the Hyp during this period remained constant while significantly deceasing in the control group ($p<0.01$). Substantial growth attenuation of the facial skeleton was found in the male Hyp mouse affected with X-linked dominant hypophosphatemia.

1888 Growth Hormone's Effect On Craniofacial Growth Following Dietary Protein Deficiency. P.M SPALDING*, S.S. LUDDINGTON, T.M. PETRO, L.C. ERICKSON (Depts of Growth & Development and Oral Biology, UNMC College of Dentistry, Lincoln, NE, USA).

Protein calorie malnutrition results in retarded growth of long bones and craniofacial structures. The purpose of this study was to evaluate the effect of growth hormone (GH) supplementation with and without realimentation on tibial epiphyseal growth rate and craniofacial growth following chronic dietary protein deficiency Eighty weanling female BALB/c mice were randomly divided into 4 groups (n=20/group). Group 1 received a normal diet (20% casein) for 8 weeks. Group 2 received a low-protein diet (4% casein) for 8 weeks. Group 3 received a low-protein diet for 8 weeks, followed by 2 weeks of normal diet Group 4 received a low-protein diet for only 2 weeks before sacrifice. Groups 1-3 all were sacrificed after 8 weeks. During the last 2 weeks before sacrifice, each group received bi-daily intraperitoneal (IP) injections of 0.1 ml buffer solution (half of each group received 10 µg of rat GH and the other half received no rat GH) All mice received 65 mg/kg IP injections of calcein on the tenth and third day prior to sacrifice *Proximal tibial epiphyseal growth rate was evaluated by histomorphometric analysis and craniofacial skeletal* growth by standardized cephalometric analysis Data were analyzed with t-tests to assess the effect of GH on animals receiving a similar diet and control animals treated with sham injections for each measured variable A repeated measures ANOVA test was used to analyze craniofacial growth parameters Protein deprivation resulted in significantly ($p \leq .05$) decreased growth for both tibial and craniofacial skeletal parameters. GH, in conjunction with realimentation, resulted in catch-up skeletal growth as measured by proximal tibial epiphyseal growth rate and a trend for catch-up in craniofacial skeletal growth Protein-deprived animals receiving realimentation or GH alone displayed accelerated proximal tibial epiphyseal growth, but failed to restore craniofacial growth parameters. Following dietary protein deficiency, 1) tibial and craniofacial skeletal growth are reduced in growing mice; 2) GH supplementation in conjunction with realimentation helps restore long bone growth. There was a trend for the combination of GH and realimentation to restore craniofacial skeletal growth 3) GH supplementation alone or realimentation alone did not help restore craniofacial skeletal growth, but did help increase the rate of tibial epiphyseal plate growth