EFFECTS OF INORGANIC ADDITIVES ON OSTEOLASTS AND OSTEOCLASTS

THE EFFECTS OF INORGANIC ADDITIVES TO CALCIUM PHOSPHATE ON IN VITRO BEHAVIOR OF OSTEOLASTS AND OSTEOCLASTS.

This study describes a medium-throughput system based on deposition of calcium phosphate films in multi-well tissue culture plates that can be used to study the effect of inorganic additives on the behavior of osteoblasts and osteoclasts in a standardized manner. All tested inorganic species: copper, zinc, strontium, fluoride, and carbonate were homogenously deposited into calcium phosphate films in varying concentrations by using a biomimetic approach. The additives affected morphology and composition of calcium phosphate films to different extents, depending on the concentration used. The effect on proliferation and differentiation of MC3T3-E1 osteoblasts depended on the type of material and concentration tested. In general, copper and zinc ions showed an inhibitory effect on osteoblast proliferation, the effect of strontium was concentration dependent, whereas films containing fluoride and carbonate, respectively, augmented osteoblast proliferation. Copper and zinc had no effect or were mild inhibitory on osteoblast differentiation, while strontium, fluoride and carbonate ions demonstrated a clear decrease in differentiation in comparison to the control films without additives. Primary osteoclasts cultured on calcium phosphate films containing additives showed a significantly decreased resorptive activity as compared to the control, independent on the element incorporated. No cytotoxic effects at the concentrations tested were observed. The system presented in this study mimics bone mineral containing trace elements, making it useful for studying fundamental processes of bone formation and turnover. The present results can be used for modifying bone graft substitutes by addition of inorganic additives in order to affect their performance in bone repair and regeneration.

Authors: Yang L, Perez-Amodio S, Barrère-de Groot FY, Everts V, van Blitterswijk CA, Habibovic P.
Correspondence: Department of Tissue Regeneration, University of Twente, Enschede, The Netherlands.
E-mail: p.habibovic@tnw.utwente.nl
Keywords: Calcium phosphate; Carbonate; Copper; Differentiation; Fluoride; Osteoblasts; Osteoclasts; Proliferation; Strontium; Zinc.

TOPICAL IODINE AND FLUORIDE VARNISH FOR PROTECTING MOLARS

TOPICAL IODINE AND FLUORIDE VARNISH COMBINED IS MORE EFFECTIVE THAN FLUORIDE VARNISH ALONE FOR PROTECTING ERUPTING FIRST PERMANENT MOLARS: A RETROSPECTIVE COHORT STUDY

Objective: This communication examines the combined effect of topical polyvinylpyrrolidone (PVP)-iodine plus fluoride varnish in the prevention of tooth decay in erupting first permanent molars in an ongoing public health program. Methods: The evaluation employed a retrospective cohort design with two groups of children 60–83 months of age. Cohort 1 (2004–05) received three times per school year topical fluoride varnish, and Cohort 2 (2008–09) received topical application of 10 percent PVP-iodine followed at each visit with topical fluoride
varnish. The children were examined clinically at the beginning and end of the school year. \textit{Results}: The proportion of children with caries-free first permanent molars in Cohort 2 (PVP-iodine plus fluoride varnish) was 0.883 and was greater than that in Cohort 1 (varnish), which was 0.785 (Chi-square = 1.000 E1, df 1, P < 0.002). \textit{Conclusions}: This evaluation of an ongoing dental public health program adds evidence that topical antiseptics applied at the same time as fluoride varnish are more effective than varnish alone. Randomized trials are needed.

Authors: Tut OK, Milgrom PM.
Correspondence: Ministry of Health, Republic of the Marshall Islands. E-mail: dfrc@u.washington.edu
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IMPACT OF CHRONIC FLUOROSIS ON VENTRICULAR FUNCTIONS

IMPACT OF CHRONIC FLUOROSIS ON LEFT VENTRICULAR DIASTOLIC AND GLOBAL FUNCTIONS

Sixty-three patients with endemic fluorosis (36 males/27 females; mean age 33.9±8.6 years) and 45 age, sex and body mass index (BMI) matched healthy controls (30 males/15 females; mean age 32.7±8.8 years) were included in this study. Basic echocardiographic measurements, left ventricular diastolic parameters and left ventricular myocardial performance index (MPI) were measured. The left ventricular MPI was calculated as (isovolumic contraction time+isovolumic relaxation time)/aortic ejection time by Doppler. The urine fluoride levels of fluorosis patients were significantly higher than control subjects as expected (1.9±0.1 mg/L vs 0.4±0.1 mg/L, respectively; P<0.001). Isovolumic relaxation time (IVRT) and deceleration time (DT) were significantly higher in fluorosis patients than in controls (for IVRT 106.9±15.6 ms vs 96.7±12.2 ms; P<0.001 and for DT 211.7±30.7 ms vs 188.0±30.0 ms; P<0.001, respectively). MPI was significantly higher in fluorosis patients than in controls (0.62±0.15 ms vs 0.49±0.10 ms; P<0.001, respectively). We have shown that chronic fluorosis patients had left ventricular diastolic and global dysfunctions.

Authors: Varol E, Akcay S, Ersoy IH, Koroglu BK, Varol S.
Correspondence: Department of Cardiology, Faculty of Medicine, Suleyman Demirel University, Isparta, Turkey. E-mail: drercanvarol@yahoo.com.
Keywords: Echocardiographic measurements; Endemic fluorosis; Left ventricular dysfunctions; Urinary fluoride levels.

RESIDUAL ALUMINIUM IN DEFLUORIDATED WATER

RESIDUAL ALUMINIUM IN WATER DEFLUORIDATED USING ACTIVATED ALUMINA ADSORPTION - MODELING AND SIMULATION STUDIES

The removal of fluoride from drinking water by the method of adsorption on activated alumina is found superior to other defluoridation techniques mostly due to the strong affinity between aluminium and fluoride. Dissolution of aluminium from the alumina surfaces into its free and hydroxide ions in the aqueous medium is reported to be very low, but the presence of high fluoride concentrations may increase its solubility due to the formation of monomeric aluminium fluoride and aluminium hydroxyl fluoride complexes. An Activated Alumina Defluoridation Model Simulator (AAD) has been developed to represent fluoride adsorption on
the basis of the surface complexation theory incorporating aspects of aluminium solubility in the presence of high fluoride concentrations and pH variations. Model validations were carried out for residual aluminium concentrations in alumina treated water, by conducting a series of batch fluoride adsorption experiments using activated alumina (grade FB101) treating fluoride concentrations of 1–10mg/L, at varying pH conditions. The total residual aluminium in the defluoridated water is due to presence of both dissolved and precipitated Al-F complexed forms. The Freundlich adsorption isotherm was found fit for fluoride adsorption capacity versus residual fluoride concentrations for pH=7.5, and the relationship is given by the linearised equation \[ \log(x/m) = \log k + \frac{1}{n} \log C(e) \] with values of \( k = 0.15 \) mg/g and \( 1/n = 0.45 \) indicating favorable adsorption. The relationship is linear in the region of low fluoride concentrations, but as concentrations of fluoride increased, the formation of the dissolved AlF\(_x\) complexes was favored over adsorption on alumina, and hence makes the isotherm nonlinear. The AAD simulations can predict for operating fluoride uptake capacity in order to keep the residual aluminium within permissible limits in the alumina treated water.

Authors: George S, Pandit P, Gupta AB.
Correspondence: Department of Chemical Engineering, Malaviya National Institute of Technology Jaipur, J. L. N. Marg, Jaipur, Rajasthan 302017, India.
Keywords: Activated alumina; Aluminium; Aluminium-Fluoride complexes; Defluoridation.

ADOLESCENT DENTAL CARIES DIFFERENCES IN DENMARK
FACTORS ASSOCIATED WITH INTER-MUNICIPALITY DIFFERENCES IN DENTAL CARIES EXPERIENCE AMONG DANISH ADOLESCENTS: AN ECOLOGICAL STUDY

Background: Caries in children and adolescents in Denmark has declined significantly over the last 30 years. Our first analysis in 1999, however, disclosed huge inter-municipality disparities in mean DMFS values as well as in the prevalence of caries on Danish children; that fluoride in the water supply and the length of the education of the mothers could explain up to 45% of the above-mentioned disparity; and that very few municipalities were positive outliers, i.e. were providing significantly better caries results than expected from the background variables. Three of the aims of this second analysis were to repeat the analyses done on the 1999 sample, but now on a 2004 sample and then compare it with the results from 1999. A fourth aim was by means of an interview of CDOs (community dental officers) to determine their interpretation of relevant conditions in the public dental health service in relation dental health outcome. Methods: A total of 204 (99%) and 191 (93%) municipalities were involved in 1999 and 2004, respectively. Units of analysis were the municipalities. Mean DMFS of 15-year-olds was used as outcome variable. Eight background variables were accounted for during the analysis: For the fourth aim, a sample of CDOs representing municipalities with positive (n = 10), with no change (n = 10), or with negative change (n = 10) in mean DMFS, relative to all municipalities, between 1999 and 2004 was selected. Results: The inter-municipality variation in mean DMFS 1999 was 0.88 to 8.73 and in 2004 was 0.56 to 6.19. The analyses found that fluoride level of the drinking water and mothers' length of education were significant
variables explaining about 44% of the variations in mean DMFS in both years. Only one municipality was characterized as a positive outlier in 1999 as well as in 2004. The dose-response relations between increasing fluoride concentrations in the water supply and DMFS values diminished in both years at a level above 0.35 ppm. The structured interview disclosed that municipalities with significant improvement in mean DMFS from 1999 to 2004 had established goals and were committed to the prevention of dental caries at the individual level. Instability in manpower; number of children in the service, and economy was associated to municipalities with negative changes in caries experience.

Authors: Ekstrand KR, Christiansen ME, Qvist V, Ismail A.
Correspondence: Kim Ekstrand, Department of Cariology and Endodontics, Dental Faculty, Copenhagen, Nørre Allé 20, 2200 N Denmark; Email: kim@odont.ku.dk
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ORAL HEALTH AND AESTHETIC PERCEPTIONS OF DENTAL FLUOROSIS

A LITERATURE REVIEW OF AESTHETIC PERCEPTIONS OF DENTAL FLUOROSIS AND RELATIONSHIPS WITH PSYCHOSOCIAL ASPECTS/ ORAL HEALTH-RELATED QUALITY OF LIFE

Aesthetic perceptions and oral health-related quality of life concerning dental fluorosis have been assessed in several studies during the past two decades. However, no comprehensive review article summarizing the studies investigating this issue has been published. OBJECTIVE: To assess the relationships between perceptions of dental appearance /oral health-related quality of life (OHRQoL) and dental fluorosis. METHODS: The PubMed database was searched using the Medical Subject Headings (MeSH) for English-language studies from 1985 to March 2009. Thirty-five articles qualified for inclusion and then were classified into three categories based on the type of study approach: (i) respondent review of photographs and assessment concerning satisfaction /acceptance, (ii) respondent assessment of study subject’s teeth concerning satisfaction /acceptance, and (iii) respondent assessments of the psychosocial /OHRQoL impact. RESULTS: There were varied results from earlier studies focused on satisfaction /acceptance of very mild to mild fluorosis. More recent studies with methodological improvements to assess impact on quality of life clearly showed that mild fluorosis was not a concern. Furthermore, mild fluorosis was sometimes associated with improved OHRQoL. Severe fluorosis was consistently reported to have negative effects on OHRQoL. CONCLUSION: Because dental fluorosis in the United States and other nations without (or few) high levels of naturally-occurring fluoride is mild or very mild, with little impact on OHRQoL, dental professionals who advocate the use of fluorides for caries prevention should emphasize their appropriate limitation for preventing moderate /severe fluorosis.

Authors: Chankanka O, Levy SM, Warren JJ, Chalmers JM.
Correspondence: Professor Steven M. Levy, Department of Preventive and Community Dentistry, College of Dentistry, University of Iowa, Iowa City, Iowa, 52242, USA; e-mail: steven-levy@uiowa.edu
Key words: Aesthetic perceptions; Dental fluorosis; Oral health-related quality of life.
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