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Corresponding address:
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EROSION 2010

Bauru School of Dentistry-University of São Paulo

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October 20-22, 2010

Oct, 20th 9:00-10:30
"Understanding the biochemistry of Dental Erosion"
Domenick Zero (Indianapolis, USA)

Oct, 20th 11:00-12:30
"Chemical factors influencing erosive potential and strategies for making beverages less erosive"
Peter Shellis (Bristol, UK)

Oct, 20th 16:00-17:00
"Diagnosis of erosion: overview, criticism and new perspectives"
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Oct, 21st 8:00-9:00
"Impact of mechanical forces on dental erosive wear"
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"The impact of behavioural factors and systemic diseases on prevalence of dental erosion"
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Wilson Garone Filho (São Paulo, Brazil)

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CONGRESS INFORMATION

The Organizing Committee of EROSION 2010 is very honored to welcome you in Bauru, SP, from October 20th to 22th, 2010.

Over recent decades, with the decline in the prevalence of dental caries in most developed countries, as well as in Brazil, an increasing interest in other dental disorders has come including tooth wear, which is also known as non-carious lesion (erosion, attrition and abrasion). Dental erosion has been recognized as the main factor for the increase in prevalence of tooth wear, due to the fact that the teeth nowadays remain in the mouth for a longer time, and people now are having in general better life conditions when compared to the past. The etiology of dental erosion is very complex, involving different behavioral, biological and chemical factors. Insights into preventive strategies as well as rehabilitation options should be investigated, in order to promote better conditions for the patients suffering of these oral problems.

Accordingly, EROSION 2010 is a unique opportunity for the development of new ideas, exchange of knowledge, discussion of different points of view and identification of research needs aiming at establishing preventive and treatment protocols for non-carious lesions, focusing on dental erosion.

Bauru is a warm city localized in the Midwestern of São Paulo state, with a distance of the state Capital around 350 km. The population is around 370,000 and the municipal area has 675.2 km². Established in 1896, Bauru is a trade center for an agricultural region, with two Public and five Private Universities. It is the hometown of Marcos César Pontes, the first Brazilian astronaut to travel to the space. It is also the town where Pelé grew up and learned his soccer skills. Bauru is also famous because of a typical Brazilian sandwich that has the name of the city. The traditional recipe calls for mozzarella cheese melted in a bain-marie, slices of roast beef, tomato and pickled cucumber in a French bun with the crumb (the soft inner part) removed. You should taste it.

We hope you will enjoy your time here and have the opportunity to visit nice places around Brazil.

Ana Carolina Magalhães
Marília Afonso Rabelo Buzalaf

Invited speakers' abstracts

Conference

Understanding the biochemistry of dental erosion

D.T. Zero[1], A. Hara[1]

1- Department of Preventive and Community Dentistry, Indiana University School of Dentistry, USA.

Dental erosion is caused by the contact of acidic solutions with the dental structures, mediated or not by saliva and/or dental pellicle. During the erosive process, demineralization occurs by the interaction between the erosive agents and the dental mineral crystals, etching away the dental surface and leading to the development of a surface-softened lesion. Type of acid, pH, titratable acidity and calcium and phosphate concentrations seem to play a significant role defining the aggressiveness of the erosive attack. Morphologically, acids will cause either the prism cores or interprismatic areas to dissolve, showing a honeycomb structure in prismatic enamel. In aprismatic enamel, the dissolution is irregular, with no clear structural pattern. In dentin, initial demineralization is observed in the peritubular area, moving towards the intertubular dentin, as the erosive lesion progresses. The organic matrix of demineralized dentin can influence the progression of erosion in dentin. Saliva and dental pellicle are capable of counteracting the acid attacks either by reducing the demineralization or enhancing the remineralization of the eroded substrate. These effects are enhanced if the presence of fluoride is taken into consideration. It has been observed that the protection caused by saliva, dental pellicle and fluoride are more relevant for prevention of erosion especially in enamel, with little or no protective effect in dentin. However, if the erosive challenge is severe enough extensive surface loss with subsequent tooth destruction will occur.

Conference

Chemical factors influencing erosive potential and strategies for making beverages less erosive

R.P. Shellis

University of Bristol, UK.

The severity of an erosive challenge is usually much greater than that of a cariogenic challenge because of the generally much lower pH (approximately 2.4-4.0 compared to 4.0-5.5) and the near-absence of calcium and phosphate ions. *In vitro* studies have identified pH, the flow rate of erosive liquids at the tooth/fluid interface and buffer capacity (related to acid concentration) as major factors in erosivity. A less important factor is temperature. These factors seem to interact in a complex way, and *in vivo* the severity of an erosive challenge is modified by host factors, e.g. variations in salivary pellicle, salivary flow rate and composition (particularly buffering properties, pH, calcium and phosphate concentrations), and drinking habits. Erosivity of a particular beverage may thus be difficult to predict accurately. The responses of enamel and dentin can differ greatly, and it is important to study both tissues. Acidic soft drinks and fruit drinks are considered to be major contributors to the clinical problem of dental erosion and there has been considerable interest in ways of reducing their erosivity. Such drinks tend to have a relatively simple composition, and it is thus fairly straightforward to make modifications that will have predictable effects on erosivity. One approach is to reduce the chemical driving force for dissolution by raising pH or by adding calcium, phosphate or both ("common-ion effect"). Drinks modified by calcium addition (with an accompanying increase in pH) have been shown clinically to have very low erosivity. Phosphate addition is much less effective than calcium addition at the low pH of erosive drinks. There are quite narrow limits to increasing pH or addition of calcium or phosphate since these modifications alter flavour and can reduce shelf life. A second approach is to add surface-reactive inhibitors of apatite dissolution to a drink. Such inhibitors must be approved for food use. Xanthan gum has been shown to augment the effect of calcium addition. Other potential inhibitors of dissolution (e.g. ovalbumin, casein) have been identified in the laboratory and among available gums and proteins there may be many that could prove to be useful inhibitors. One disadvantage of such macromolecules is their possible instability and chemical modifications to improve stability might be needed. Addition of CPP-ACP has been shown to reduce erosivity of a sports drink but whether this is due to a common-ion effect or inhibition is unknown. Inhibitory substances such as fluoride and various metal ions cannot be added to beverages that will be consumed *ad libitum*, because of potential toxicity problems, and are more suitable for use as topical treatments.

Symposium

Diagnosis of erosion: overview, criticism and new perspectives

C. Ganss[1], F.C. Sampaio[2]

1- Department of Conservative and Preventive Dentistry, University of Giessen, Germany.
2- Department of Clinic and Social Dentistry, Federal University of Paraíba, Brazil.

Erosive tooth wear is raising increasing interest in clinicians and researchers. In the literature, the diagnostic criteria relevant for erosion are clearly defined on an individual basis, but there is relatively few knowledge about the significance of the condition for oral health on a population based level. This is one hand due to the lack of published surveys, but on the other hand due to methodological flaws. Unlike for caries, where the DMF-Index is a standardised and worldwide accepted tool, a considerable number of indices have been used in erosion epidemiology. Respective tools basically emerged from the Tooth Wear Index (Smith and Knight, 1984) or the Erosion Index published by Eccles and Jenkins (1979). These pioneering approaches were developed from personal experience and from findings in small patient groups, but have been used until today, though often modified, without further validation. The first criticism refers to the question, how valid the diagnostic criteria propagated in these indices are. Secondly, though different with respect to scoring and grading, one common criterion of most indices is the differentiation between lesions restricted to enamel and lesions reaching the dentin as threshold for grading severity. Point of discussion is if dentin exposure can be reliably diagnosed and if exposed dentin does also mean severe loss of tooth structure. Finally, erosive wear contributes to the physiological wear and tear of teeth and it is not self-evident how to define dental erosion as an oral disease. A new perspective in erosion epidemiology is the development of the Basic Erosive Wear Examination (BEWE) published as result of an international consensus workshop. The BEWE has been designed to provide a simple tool for use in general practice as well as in research. A further aim was to increase the awareness of tooth erosion amongst clinicians and general dental practitioners. Importantly, the BEWE is not only a tool for diagnosis and scoring, but includes also a strategy for guiding into prevention and management. Presentations will give an overview over the most important indices, will raise criticism and identify flaws of current approaches and will end with the presentation and discussion of the BEWE.

Round Table

Is dental erosion a problem for Brazilian children and teenagers?

M.A.A.M Machado[1], S.H. Sales-Peres[1], M. Bonecker[2]

1- Department of Pediatric Dentistry, Orthodontics and Community Health, Bauru School of Dentistry, University of São Paulo, Brazil.
2- Department of Pediatric Dentistry, School of Dentistry, University of São Paulo, Brazil.

Results from epidemiological studies regarding the prevalence of dental erosion are difficult to be compared due to the lack of methodological standardization with distinct population samples size and age and to the different dental erosion or wear indexes employed. Variations in clinical criteria for dental erosion diagnosis as well as the difficulty to differ attrition, abrasion and erosion turn the clinical study difficult to be performed. Moreover, dental erosion presents a multifactorial etiology, and its occurrence seems to be associated with educational, geographic, socioeconomic and cultural aspects of each country or region. Some studies suggest that the incidence of dental erosion has increased among children and teenagers in the last years. van Rijkom, et al. (2002) performed a research with 12-year old children in order to detect the presence of erosive lesion, which could be visually detected in only 3% of the individuals. Two years later, a new epidemiological study using the same diagnosis criteria was accomplished, and dental erosion was substantially increased (24%) in people at the same age (Truin, et al., 2005). In Brazil, some studies have pointed out that dental erosive lesions are observed mainly in teenagers. Peres, et al. (2005) found enamel erosion in maxillary incisors in 13% of 12-year old children. Another study was performed by Sales-Peres, et al. (2008), with 12-year old children; however, it was found a higher prevalence of dental erosion (26.9%). It should be highlighted that this research used Dental Wear Index (DWI) and analyzed all teeth. Corrêa (2006) evaluated patients between 2 and 20 years old in private practice and found 31% of erosive lesion in permanent dentition. In addition, Auad, et al. (2007) studied the prevalence of erosion in teenagers (13 to 14 years old) and observed that 34% of the subjects had clinical signs of enamel erosion with no dentin involvement. Similar results were found by Gurgel, et al. (2009) in a randomized clinical trial with 414 teenagers between 12 and 16 years old, in which enamel erosion was detected in 20% of the sample. Therefore, although areas with high incidence of dental caries can be found in Brazil, dental erosion is also an occurrence that deserves attention of professionals and researchers, since it can be frequently detected in children and adolescents.

Conference

Impact of mechanical forces on dental erosive wear

A. Wiegand

Clinic for Preventive Dentistry, Periodontology and Cariology, University of Zurich, Switzerland.

Eroded dental hard tissues are known to present a higher susceptibility to mechanical forces than sound enamel and dentin, so that abrasive but also attritive influences might potentiate erosive wear. Abrasion of eroded surfaces might be mainly induced by toothbrushing and only to a lesser extent by tongue friction or friction of surrounding soft tissues. Several variables, such as timepoint of toothbrushing after an erosive attack, kind of toothbrush, abrasivity and fluoride content of toothpastes as well as the applied brushing force, are suggested to influence toothbrushing abrasion. Compared to abrasive processes, information about the interaction of attrition and erosion is scarce, and clinical studies are missing as yet. From few *in vitro* studies it is known that attritive wear is increased under severe erosive conditions (pH 1.2), but is lower in the presence of acids of pH 3 than in the presence of water and saline. This presentation aims to summarize the major causes of mechanical wear of eroded enamel and dentin and to determine how different wear mechanisms might interact.

Conference

The impact of behavioural factors and systemic diseases on prevalence of dental erosion

D.T. Zero[1], A. Hara[1]

1- Department of Preventive and Community Dentistry, Indiana University School of Dentistry, USA.

While the actual process of dental erosion is a chemical interaction between acids of intrinsic and extrinsic origin and the tooth surface, individual human behaviors can significantly influence its clinical expression. Dietary acids represent the greatest erosion risk for most individuals, and thus food and beverage choices, and the frequency and duration of consumption are the most important lifestyle factors. Frequent consumption of acidic fruits and vegetables, fruit juices, acid carbonated and uncarbonated beverages, alcopops and acidic sports drinks have all been implicated. Also certain behaviors occurring during, (e.g. swishing acid beverages), and after (e.g. overzealous oral hygiene practices) an erosive challenge can influence the extent of erosive tooth wear. Intrinsic etiological factors involve gastric acid entering the oral cavity due to vomiting, gastroesophageal reflux disease and rumination. Anorexia and bulimia psychosomatic eating disorders have been strongly associated with erosion as a consequence of frequent self-induced vomiting. Somatic causes of vomiting-related erosion include the emetic side-effects of medications, chronic alcoholism, metabolic and endocrine disorders, pregnancy and gastrointestinal disorders, such as chronic gastritis and peptic ulcers. Patient education and medical referral to help eliminate or reduce etiologic factors and frequent applications of high concentration fluoride are the main preventive strategies.

Round Table

Role of fluoride and fluoride compounds in the management of dental erosion

C. Ganss[1], A.C. Magalhães[2], A. Wiegand[3]

1- Department of Conservative and Preventive Dentistry, University of Giessen, Germany.
2- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.
3- Clinic for Preventive Dentistry, Periodontology and Cariology, University of Zurich, Switzerland.

Erosive dental hard tissue loss develops under the chronic exposure to extrinsic or intrinsic acids with low pH. The result is a centripetal bulk substance loss combined with a small partly demineralised surface zone with decreased microhardness. This feature makes strategies necessary which are basically and essentially different from strategies for caries prevention. One approach for prevention and therapy of dental erosion is the use of topical fluorides in form of toothpastes, solutions, gels and varnishes. The anti-erosive potential of conventional fluorides, such as amine or sodium fluoride, is mainly related to the formation of CaF_2-precipitates which are assumed to act as a physical barrier hampering the contact of the acid with the underlying enamel or as a mineral reservoir, which is attacked by the erosive challenge, thus leading to a buffering or depletion of hydrogen ions from the acid. High concentrated fluoride agents or a prolonged application time lead to a thicker and more stable CaF_2-precipitate, so that an intensive fluoridation is considered as most effective for the prevention of erosive mineral loss. However, CaF_2-precipitates are readily soluble in acids and the erosion-protective capability of sodium or amine fluorides probably is limited. Therefore, current research is looking for more effective fluoride compounds. In this context, compounds containing polyvalent metal ions such as stannous fluoride or titanium tetrafluoride have shown promising results. Their mode of action is probably attributed to the formation of metal-rich surface precipitates, which were shown to be of high acid resistance. The presentation will give an overview about the current knowledge of fluorides, particularly compounds containing polyvalent metal ions, on the prevention of erosive and combined erosive-abrasive tooth wear.

Round Table

Biological factors for dental erosion: enzymes (MMPs), salivary pellicle and saliva

M.A.R. Buzalaf[1], H.M. Honório[2], W.L. Siqueira[3]

1- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.
2- Department of Pediatric Dentistry, Orthodontics and Community Health, Bauru School of Dentistry, University of São Paulo, Brazil.
3- Schulich Dentistry, Schulich School of Dentistry & Medicine, University of Western Ontario, Canada.

Dental erosion is defined as the loss of tooth substance by acid exposure not involving oral bacteria. The etiology of erosion is related to different behavioral, biological and chemical factors such as the properties of saliva, the acquired enamel pellicle components as well as the presence of dental plaque. Enamel and dentin are very different tissues and the progression of erosion is also very different when these two tissues are considered. Basically, permanent enamel is composed by mineral (85% volume), in the form of (hydroxy or fluor) apatite crystals organized in prisms. At a pH lesser than 4.5, the apatite crystals are easily dissolved by the acids, generating a surface lesion, while the subsurface region also undergoes some degree of demineralization. Dentin, however, contains 47% of mineral (apatite), 33% of collagen and 20% of water. Dentin erosive demineralization results in the exposure of an outer layer of fully demineralized organic matrix followed by a partly demineralised zone, until the sound inner dentin is reached. The demineralised organic matrix is attributed to hamper ionic diffusion into and out of the demineralizing area and its maintenance has been reported to slow down the progression of erosion. Recently, it has been suggested that MMP inhibitors such as green tea or its active principle (EGCG), chlorhexidine and iron, could reduce the progression of erosion by avoiding the degradation of the demineralized organic matrix. The potential application of this new therapy will be discussed. Saliva plays an important role in minimizing enamel and dentin wear in erosive/abrasive attacks due to its buffering and remineralizing capacities as well as to its ability to form a protective natural protein film on dental hard tissues. Salivary and pellicle proteome certainly plays a key role on their protective effect against erosion/abrasion. State-of-the-art information on this regard will be presented. Finally, recent studies have shown that the presence of dental plaque can decrease the acid attack of erosive beverages on enamel and no deleterious cumulative effect of cariogenic and erosive challenges on surface enamel alterations occur. Moreover, the combination of both challenges has been reported to produce less softening of the enamel surface than the single erosive or cariogenic challenges. The rationale and implications of these recent findings will also be discussed.

Conference

Laboratory measurement of dental erosion and abrasion

T. Attin

Clinic for Preventive Dentistry, Periodontology and Cariology, University of Zurich, Switzerland.

Dental erosions mainly show two kinds of characteristics, namely the complete loss of dental hard tissue on the one hand, and on the other hand the demineralization and softening of the surface of the teeth. The loss of dental hard tissue might additionally be amplified by abrasion due to toothbrushing or mastication. *In vitro* studies dealing with dental erosion try to quantify these two main sequelae of the acidic challenge, closely simulating the intra-oral conditions. Therefore, different approaches regarding the mode of the erosive and abrasive attack and different modes of quantification might be applied. Different modes of the erosive challenge could imply different frequencies or durations of the acid application, and presence or absence of others aspects, such as remineralization periods or formation of the salivary pellicle on top the tooth specimens prior to the erosive attack. The damage induced in the dental hard tissue might then be quantified by physical methods (e.g. microhardness testing, profilometric determination of hard tissue loss, microradiography) or by chemical methods determing the amount of mineral dissolved from the tooth. The lecture aim to discuss different parameters used in *in vitro* erosion studies and to suggest an *in vitro* design, which might reflect intra-oral conditions as closely as possible.

Symposium

New methods to prevent dental erosion

M.A.R. Buzalaf[1], D. Rios[2]

1- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.
2- Department of Biological Pediatric Dentistry, Orthodontics and Community Health, Bauru School of Dentistry, University of São Paulo, Brazil.

Firstly, a summary of the current preventive strategies relevant for patients suffering from dental erosion will be given based on an overview of the current literature. These preventive methods will be divided in accordance to their etiology as behavioral, biological and chemical factors. The preventive strategies for behavioral factors include measures to reduce the frequency and duration of acid exposure as well as adequate oral hygiene measures. The strategies related to biological factors are the increase in the production of saliva, especially in patients with hyposalivation or xerostomia. With regard to chemical factors, the modification of acidic solutions with ions was shown to reduce the demineralization and recent results will be shown. After this introduction, new preventive strategies will be presented and discussed. The speakers will show studies that evaluated the use of calcium application, such as Casein/calcium phosphate-containing tooth cream and Casein phosphopeptide - amorphous calcium phosphate to prevent enamel and dentin erosion. The development of fluoride with different formulations such as the titanium tetrafluoride varnish will be discussed showing their advantages and limitations. Another discussed method will be the laser application, since its protective effects on enamel and dentin demineralization have gained increasing attention in the last years. Studies with the association of laser irradiation and fluoride application will be compared to current preventive measures for dental erosion such as the high concentrated fluoride application. Finally, it will be shown matrix metalloproteinases inhibitors agents for dentin erosion prevention. Matrix metalloproteinases (MMPs) are responsible for hydrolyzing the components of the extracellular matrix (ECM) during the remodeling and degradation processes in the oral environment. Thus, the organic matrix of dentin (collagen) can be degraded by MMPs present in dentin and saliva. The activation of MMPs seems to play a role in dentinal caries progression, since they have a crucial role in the collagen breakdown in caries lesions. Despite the lack in studies investigating the role of MMPs in dental erosion, processes similar to the caries development can be assumed for erosive lesions. Taking these aspects into account green tea polyphenols, especially epigallocatechin gallate (EGCG) and chlorhexidine (CHX) have been tested for dentin erosion progress prevention and these studies will be presented. At the end of the symposium the speakers will conclude which of these new methods is nearest to the ideal preventive strategy.

Conference

Dentin erosion and hypersensibility: diagnostic and treatment

J.C. Pereira

Department of Operative Dentistry, Dental Materials and Endodontics, Bauru School of Dentistry, University of São Paulo, Brazil.

The estimated prevalence of dentin hypersensitivity is about 15% of the population. It can be assumed that the percentage of dentin exposure to oral cavity due to non-carious factors is even higher. Dentin can be exposed to oral environment due to different etiologies, named attrition, abrasion, erosion and abfraction and the lesions resulted from these phenomena are referred in literature as non-carious lesions (NCL). By definition, attrition is considered the wear of dental structures, enamel and dentin, due to tooth-to-tooth friction during occlusion and mastication. Abrasion is the lost of enamel and dentin caused by friction between a tooth and an exogenous agent. Erosion, or corrosion as it has been considered, is the enamel degradation due to acids or acidic substances not related to caries. Finally, abfraction is a microstructural loss of tooth substance in areas of stress concentration. It usually occurs in the cervical region of teeth. Although it is vast the literature about these subjects, there is not an unquestionable statement either regarding a specific etiology for NCL, or for the best way to prevent its occurrence. Because of this, in many instances NCL is considered a time-dependent event of multifactor etiology. On the other hand, the treatment for dentin hypersensitivity depends on the recognition and treatment of the factors causing NCL. One question arises from this situation: how can dentists correctly treat dentin hypersensitivity if dentin exposure has a multifactor etiology? These topics will be discussed during the presentation.

Symposium

Rehabilitation of the worn dentition: challenges for the dentist

G. Bonfante[1], R.G. Palma-Dibb[1], W. Garone Filho[1]

1- Department of Prosthodontics, Bauru School of Dentistry, University of São Paulo, Brazil.
2- Department of Operative Dentistry, Ribeirão Preto School of Dentistry, University of São Paulo, Brazil.
3- Department of Operative Dentistry, School of Dentistry, University of São Paulo, Brazil.

The prevalence of tooth wear in contemporary populations is increasing. Children and adolescent are affected in large scale and this fact has occurred mainly as a consequence of dental erosion. For the elderly, the fact that the natural dentition remains longer time as well as better lifespan conditions nowadays compared to the past imply an increase risk of advanced tooth wear and need for rehabilitation. There are many methods and materials available for the rehabilitation of a worn dentition, but there are also many questions about what the most appropriate and effective approach to be used in the clinical situation. In the past, the severely eroded dentition could only be rehabilitated by the extensive crown, bridge work or removable overdentures, and some cases it was necessary endodontic treatment due to an extensive procedures of rehabilitation. However, with the evolution of composite resin materials and adhesive systems, it has become possible to rehabilitate eroded dentitions in a less invasive manner. However, it is necessary to know of etiology of the erosive lesions and to control the disease; otherwise the erosive process will continue destroying tooth substance and in less intensive extension, the restorative material. The aim of this presentation will be to show the aspects concerning the restorative materials as well as the treatment options available to rehabilitate patients with dental erosion, mainly in procedure minimally invasive with direct composite reconstructions. Restorative treatment options are dependently on individual circumstances, the perceived needs, concerns of the patient and our awareness. Success of this treatment is only possible when the cause is eliminated and clinical protocol follows the principles of minimally invasive treatment.

Posters' abstracts

Influence of different adhesive systems on microshear bond strength to enamel and dentin after erosive process

E.A. Almeida[1], S.S.M.F.G Rodrigues[1], L.C. Costa[1], H.D.C. Miranda Filho[1], R.S.M.F. Oliveira[1], L.A. Salvio[1]

1- Department of Restorative Dentistry, Federal University of Juiz de Fora, Brazil.

The aim of the present study was to verify the microshear bond strength of total and self-etching systems on the surface of enamel and dentin after erosive process. 40 bovine incisors were sectioned and polished until the surfaces got planned in enamel and in crown dentin. On these, erosive process was simulated using Coke®, 4 times during 10 min daily, for 10 days. After, the samples were divided in 4 groups (n=20): G1-enamel and G2-dentin, both surfaces were hybridized with total-etching adhesive system (Adper Single Bond II); G3-enamel and G4-dentin were hybridized with self-etching system (Clearfil SE Bond). Resin composite cylinders (Filtek Flow Z350) with 2 mm of height and 0.8 mm of diameter were constructed on these hybridized surfaces and then they were stored in distilled water at 37ºC for 24 h. Subsequently, they were submitted to the microshear test in a universal machine (Emic DL 2000) with speed of 1 mm/min until failure. The results were submitted to one-way ANOVA and the means were compared by the test post-hoc Games-Howell. The groups G1 and G3 presented the highest mean values (11.92 and 14.93MPa respectively), which were statistically different ($p<0.05$). On the other hand, the groups G2 and G4 showed the lowest mean values of bond strength (2.35 and 5.50 MPa respectively) which were statistically different ($p<0.05$). For both substrates, self-etching system lead to a higher bond strength than total-etching adhesive system. It can be concluded that both adhesives were effective for enamel, which presented the greatest bond strength values. On the other hand, both adhesives drastically showed negative values for dentin.

Corresponding author: Luciana Andrea Salvio. Rua José Lourenço Kelmer s/n, Campus Universitário, Juiz de Fora-MG, Brazil, 36036-900. Tel: +55-32-2102-3859 - E-mail: lucianasalvio@ufjf.edu.br

In vitro effect of CO_2 laser (10.6 µm) in enamel erosion prevention

K.M. Ramalho[1,2], C. Apel[1], F. Lampert[1], R.G. Rocha[2], C.P. Eduardo[3], M. Esteves-Oliveira[1]

1- Department of Operative Dentistry, Periodontology and Preventive Dentistry, RWTH Aachen University, Germany. 2- Department of Stomatology, Integrated Clinic, University of São Paulo, Brazil. 3- Department of Restorative Dentistry, University of São Paulo, Brazil.

The aim of this study was to analyze the effect of CO_2 laser (10.6 µm) irradiation in prevention of enamel erosion due to citric acid exposure *in vitro*. 56 bovine enamel samples were cut into 5x5x2mm-size slabs and polished to obtain a plane surface. Enamel surfaces were covered with acid-resistant varnish, except for a central area of 2.5 mm in diameter. The samples were divided into 4 groups (n=14/group): G1–no treatment (control); G2-CO_2 laser irradiation (0.3 J/cm2-5 µs-226 Hz); G3–topical fluoride treatment - 1.25% F (AmF/NaF) for 3 min; G4-fluoride treatment + CO_2 laser. For erosive demineralization, the samples were immersed in 80 mL of 0.05 M citric acid (pH 2.3) for 20 minutes, 2x/day, during 5 days. Between acid exposures the samples were maintained in deionized water. After 1, 3 and 5 days, surface loss was measured by digital profilometer. Additionally, 2 samples/group were prepared after treatments for morphological analysis by scanning electron microscope (SEM) and fluoride content quantification by energy dispersive X-ray analysis (EDX). Obtained data were statistically analyzed by means of ANOVA and Tukey tests (α=0.05). On days 1, 3 and 5, all the treatments significantly reduced enamel loss compared to control (G2: 52%, 31%, 37%; G3: 28%, 24%, 29%; G4: 73%, 55%, 57%), respectively. CO_2 laser irradiation associated with fluoride (G4) lead to the lowest enamel loss compared to fluoride group in all days ($p<0.05$). Laser alone (G2) also showed significant difference to fluoride group (G3) in all days ($p<0.05$). SEM images showed no surface damage caused by laser irradiation. EDX showed a significant increase of fluoride content only in G4. CO_2 laser irradiation associated with fluoride showed the highest potential to reduce enamel surface loss caused by citric acid *in vitro*. This effect was still observed after 5 days of repeated acid attacks. Financial support: Forschungsgemeinschaft Dental.

Corresponding author: Karen Müller Ramalho. Av. Professor Lineu Prestes, 2227, São Paulo-SP, Brazil, 05508-000. Tel: +55-11-3091-7645 - Fax: +55-11-3091-8401 - E-mail: karenmr@usp.br

A rough idea? An alternative method for describing early erosive surface change

J. Field[1], P. Waterhouse[1], M. German[1]

1- School of Dental Sciences, Newcastle University, UK.

This *in vitro* study aimed to investigate an alternative profilometric method for reporting early erosive surface changes on human and bovine enamel. Most dental studies report roughness average (Ra), but in isolation, this may misrepresent surface features. Enamel of human (n=4) and bovine (n=15) permanent lower incisor crowns was lapped to 1200 grit-size and a baseline profile taken using a stylus profilometer. Prepared teeth (n=20) were equally split between 4 experimental erosive conditions: 1% citric acid (pH 2.2) and 6% citric acid (pH 1.8) for 15 s and 2 min respectively. Immediately after each challenge, samples were rinsed with balanced salt solution and profiled. Ra was recorded, but also the bearing area parameters, giving information about the proportions of peaks/troughs. One-way multivariate analysis was performed (SPSS, v17.0), investigating treatment differences on surface parameters. Although there were no significant differences in baseline Ra for human (x 0.12 µm) and bovine samples (x 0.13 µm) ($p=0.576$ CI 95%), $\bar{a}$ number of bearing parameters were significantly different; human samples had higher proportions of peaks (Mr1 value 21.94% c.f. 7.13% for bovine) and bovine samples had higher proportions of troughs (MR2 value 92.89% c.f. 79.50% for human) ($p<0.001$ for both, CI 95%). Post-treatment, there was still no significant difference in Ra values between human and bovine enamel ($p=0.129$, CI 95%), yet significant differences in proportions of peaks and troughs (significantly affected by species, time and concentration of citric acid, $p<0.001$, CI 95%). In conclusion, reporting bearing area parameters may allow a more comprehensive description of surface changes, than Ra alone. The results suggest that care should be taken when using bovine enamel as a substitute in erosive studies. Further, it may be possible to use bearing parameters to predict longer-term effects of a range of other physical insults, such as hygiene regimes, dietary patterns and methods of micro-abrasion/polishing.

Corresponding author: James Field. Restorative Dentistry, Level 5, School of Dental Sciences, Framlington Place, Newcastle-upon-Tyne, NE2 4BW. Tel: +44-191-222-8515 - E-mail: james.field@ncl.ac.uk

Awareness and practices related to dental erosion among undergraduate dental students from Belo Horizonte, Brazil

A.P.B.V. Hermont[1], K.M. Sutana[1], M.R. Pereira[1], P.A.D. Oliveira[1], S.M. Auad[1]

1- Department of Pediatric Dentistry and Orthodontics, Faculty of Dentistry, Federal University of Minas Gerais, Brazil.

This study aimed to assess awareness and practices related to dental erosion among undergraduate dental students at the Faculty of Dentistry of the Federal University of Minas Gerais, Belo Horizonte, Brazil. Ethical approval and written consents were obtained. A self-applied questionnaire was answered by all students from the 4th (n=52 - Group A) and 8th academic semesters (n=55 – Group B). Data were analyzed using the Fisher's exact

test and Odds Ratio (OR), with a level of statistical significance of 5%. Overall, students in group B gave more correct answers to the questions when compared to students in group A. Among the 107 students, 98.1% had heard about dental erosion, with similar percentages in the two groups (p=0.234). Their main source of information about erosion was the dental school (86.7%). Approximately 71% believe that sugar can contribute to erosion, being the highest percentage observed in group A (p=0.005, OR=3.726, 95% CI 1.466-9.470). Although 83.3% of the students in group B know the clinical features of erosion, 36.4% do not feel prepared to diagnose the condition and only 5.5% feel prepared to diagnose the initial stages of erosion. Almost a third of students do not know if they had a patient with erosion. Additionally, 77.6% of students in group A and 69.1% of students in group B are not advised by their clinical supervisor to examine their patients for erosion (p=0.138). Reducing the consumption of acidic drinks was the practice more frequently mentioned as recommended to prevent erosion (90.4%). However, 11.3% and 20.8% reported a daily consumption of sugared carbonated drinks and citric fruit juices, respectively. Awareness of dental erosion increased between students from groups A to B, but it seems that it has not been fully incorporated into practices aiming the prevention of the condition. Financial support: CNPq - Grant 48067-1/2007-9. Scholarship: PROBIC/ FAPEMIG.

Corresponding author: Ana Paula Brazileiro Vilar Hermont. Rua Benvinda de Carvalho, Santo Antônio, 105, 202, Belo Horizonte-MG, Brazil, 30330-180. Tel: +55-31-3227-2528 - Fax: +55-31-3409-2472 - E-mail: anapaulahermont@gmail.com

Risk indicators of dental erosion in Brazilian preschool children

C. Murakami[1], L.B. Oliveira[2], A. Sheiham[3], M.S.N.P. Corrêa[1], A.E. Haddad[1], M. Bönecker[1]

1- Department of Orthodontics and Pediatric Dentistry, School of Dentistry, University of São Paulo, Brazil. 2- São Leopoldo Mandic Institute and Research Center, Brazil. 3- Department of Epidemiology and Public Health, University College London, UK.

This study aimed to evaluate the prevalence and risk indicators of dental erosion in Brazilian preschool children. A total of 967 children aged 3 to 4 years were evaluated on a National Children Vaccination day in the city of Diadema, São Paulo. Dental erosion was assessed using a modified version of the O'Brien (1994) index. Sixteen examiners were trained and calibrated, achieving good interexaminer agreement (kappa=0.84 for lesion depth, kappa=0.70 for lesion area). Hierarchical logistic regression was applied to investigate the association between dental erosion and socioeconomic, environmental, nutritional, and behavioural factors as well as factors related to the child's characteristics. Dental erosion was present in 51.6% of the children. Erosive lesions were mainly confined to the enamel (93.9%) and occupied over two thirds of the tooth surface's area (82%). There were no significant associations with socioeconomic, environmental, and nutritional variables. Dental erosion was significantly associated with soft drink intake of twice (p=0.043) or three or more times a day (p=0.023), frequent reported gastroesophageal reflux (p=0.005) and age (p=0.003). The method of intake of acidic beverages (swallowing, swishing/keeping in the mouth or using a straw) was not significantly associated with the presence of dental erosion. A high prevalence of dental erosion was found in this population of preschool children and the risk indicators were frequent consumption of soft drinks, reported gastroesophageal reflux and an increase in age.

Corresponding author: Christiana Murakami. Av. Prof. Lineu Prestes, 2227, Cidade Universitária, São Paulo-SP, Brazil, 05508-000, Tel/Fax: +55-11-3091-7854 - E-mail: chrismurakami@gmail.com

Effect of the application time of etch-and-rinse and self-etching adhesives on microtensile bond strength to sclerotic bovine dentin

A.P. Mena-Serrano[1], E.J. Garcia[2], M.A. Muñoz[3], R.H.M. Grande[2], A.D. Loguercio[1], A. Reis[1]

1- Department of Restorative Dentistry, School of Dentistry, University of Ponta Grossa, Brazil. 2- Department of Dental Materials, School of Dentistry, University of São Paulo, Brazil. 3- Department of Dental Materials, School of Dentistry, University of Ponta Grossa, Brazil.

The aim of this study was to evaluate if duplicating the application time can improve the microtensile bond strength (μTBS) of one etch-and-rinse adhesive and two self-etching adhesives systems to sclerotic bovine dentin. Thirty bovine incisors with sclerotic characteristics were randomly divided into 6 groups (n=5). One third of each tooth was sectioned to evaluate under scanning electron microscopy (SEM) analysis the sclerotic degree. The other two thirds were restored with the adhesives GO (SDI) [GO], Adper Self Etch (3M ESPE) [ASE] or Adper Single Bond 2 (3M ESPE) [SB] according to the manufacturer's instructions (MI), or duplicating the time recommended by the manufacturer (DT). Composite build-ups were constructed incrementally. After water storage at 37°C for 24 h, teeth were sectioned to obtain sticks with cross-sectional areas of 0.8 mm^2 to be tested in tension (0.5 mm/min). Data were analyzed by two way ANOVA and Tukey's test (α=0.05). The application mode did not affect the μTBS of SB and ASE (SBMI=31.05±2.95, SBDT=30.05±5.10; ASEMI=33.97±5.02 and ASEDT=31.91±3.22). For GO, the highest μTBS values were observed for the DT application mode (GOMI=18.42±7.01 and GODT=30.01±3.31). The effect of the application time on the μTBS to sclerotic dentin seems to be adhesive dependent.

Corresponding author: Alessandra Reis. Av. Carlos Cavalcanti, 4748, Bloco M, Sala 64A, Uvaranas, Ponta Grossa-PR, Brazil, 84030-900 - E-mail: reis_ale@hotmail.com

The etching pattern of sclerotic dentin regarding conditioning time: a scanning electron microscopy analysis

E.J. Garcia[1], A.P. Mena-Serrano[2], M.A. Muñoz[3], G.C. Martins[1], R.H.M. Grande[1], A.D. Loguercio[2], A. Reis[2]

1- Department of Dental Materials, School of Dentistry, University of São Paulo, Brazil. 2- Department of Restorative Dentistry, Ponta Grossa School of Dentistry, University of Ponta Grossa, Brazil. 3- Department of Dental Materials, School of Dentistry, University of Ponta Grossa, Brazil.

The objective of this research was to evaluate the etching pattern in sclerotic bovine dentin by means of scanning electron microscopic (SEM) varying the application time of 35% phosphoric acid [PA], or the conditioners from two self etching adhesive systems, one-step (GO, [GO]) and two-step (Adper Scotchbond SE, [ASE]). The crowns of 12 bovine incisors were longitudinally sectioned into three thirds: in the first third the sclerotic degree was evaluated with no treatment [C]; in the second, the acid or conditioner was applied according to the manufacturer's instructions [MI]; in the third, the acid or conditioner was applied duplicating the time recommended by the manufacturer [DT]. Following, self-etch primers were rinsed off with a sequence of acetone (5 min), deionized water (5 min), 96% alcohol (5 min) and deionized water (5 min) baths. PA was rinsed with water for 30 s. Finally, photomicrographs obtained by SEM were used to calculate the percentage of the area occupied by dentin tubules using the software ImageTool 3.0. Data from each material were evaluated by one-way ANOVA and Tukey's test (n=4, p<0.05). MI and DT were statistically similar (PAMI=12.4±4.7%; PADT=12.7±4.9%; GOMI=14.8±5.0%; GODT=12.1±5.5%; ASEMI=14.9±5.1%; ASEDT=18.2±9.7%) and statistically superior to C (no treatment) (PAC=7.0±2.5%; GOC=6.5±5.0%; ASEC=8.2±6.7%). Conditioning time of materials used in this study did not influence the etching pattern on sclerotic bovine dentin.

Corresponding author: Alessandra Reis. Av. Carlos Cavalcanti, 4748, Bloco M, Sala 64A, Uvaranas, Ponta Grossa-PR, Brazil, 84030-900 - E-mail: reis_ale@hotmail.com

Effect of a low fluoride concentration dentifrice supplemented with trimetaphosphate on erosion-abrasion of bovine enamel. *In vitro* study

M.J. Moretto[1], A.C.B. Delbem[1], K.T. Sassaki[2], A.C. Magalhães[3], C.C.R. Martinhon[1]

1- Department of Pediatric and Social Dentistry, Araçatuba School of Dentistry, UNESP, Brazil. 2- Department of Basic Science, Araçatuba School of Dentistry, UNESP, Brazil. 3- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.

The purpose of this *in vitro* study was to evaluate the effect of a dentifrice with low fluoride concentration supplemented with trimetaphosphate on enamel erosion and abrasion. A hundred twenty bovine enamel samples were allocated to the following treatments: placebo, 1,100 µg F/g (as NaF for all dentifrices), 1,100 µg F/g Crest™ and 500 µgF/g plus 3% TMP. The samples were additionally subdivided in erosion and erosion plus abrasion conditions. During seven days, the samples were subjected to erosive challenges (Sprite zero®, 4 times *per* day, 5 minutes) followed by a remineralizing period (artificial saliva, 2 h between the cycles). After each erosive challenge, the samples were exposed to slurry of the dentifrices (10 ml/sample, 15 s). Half of the samples were additionally abraded by toothbrushing using an electrical toothbrush (15 s). Enamel loss was measured by profilometry (µm) and the data analysed using a 2-way ANOVA test followed by a Bonferroni correction ($p<0.05$). The mean enamel loss (µm) for the groups subjected to erosion was: placebo - 3.4, 1,100 µg F/g Crest™ - 2.5, 1,100 µg F/g - 2.5 and 500 µg F/g plus 3% TMP - 1.3. In the groups subjected to erosion associated with abrasion, the mean enamel loss (µm) was: placebo - 4.6, 1,100 µg F/g Crest™ - 3.1, 1,100 µg F/g - 3.4, and 500 µg F/g plus 3% TMP - 2.3. In an *in vitro* conditions, the 500 µgF/g plus 3% TMP dentifrice had a greater protective effect when compared with the 1,100 µgF/g dentifrices on enamel erosion and abrasion. Financial support: CNPq.

Corresponding author: Cleide Cristina Rodrigues Martinhon. Rua José Bonifácio 1193. Araçatuba-SP, Brazil, 16015-050. Tel: +55-18-3636-3235 - Fax: +55-18-3636-3332 - E-Mail: cleidecristina@foa.unesp.br

In vitro effect of varnishes with low-fluoride concentration containing sodium trimetaphosphate on enamel erosion

M.M. Manarelli[1], C.C.R. Martinhon[1], K.T. Sassaki[2], A.C.B. Delbem[1]

1- Department of Pediatric and Social Dentistry, Araçatuba School of Dentistry, UNESP, Brazil. 2- Department of Basic Science, Araçatuba School of Dentistry, UNESP, Brazil.

The aim of this *in vitro* study was to evaluate the effect of varnishes with low-fluoride concentrations and sodium trimetaphosphate (TMP) on enamel erosion. Enamel bovine samples (n=72) were divided into 6 groups (n=12) according to the varnish used: placebo, 5% NaF varnish, 2.5% NaF varnish, 2.5% NaF plus 3.5% TMP varnish, 2.5% NaF plus 5% TMP varnish, 2.5% NaF plus 10% TMP varnish. One layer of varnish was applied on enamel surface and removed after 24 h. The enamel samples were submitted to erosive challenge for 5 days, with Sprite Zero® for 5 minutes 4 times a day. Enamel wear (µm) were measured and the data analysed by ANOVA followed by Bonferroni test ($p<0.05$). Low-fluoride varnishes supplemented with TMP showed the lowest wear (2.5% NaF plus 3.5% TMP: 1.3; 2.5% NaF plus 5% TMP: 1.5; 2.5%NaF plus 10% TMP: 1.3). Mean enamel wear of fluoride varnishes without TMP was similar to placebo varnish (Placebo: 4.8; 5% NaF: 4.3; 2.5% NaF: 4.8). The effectiveness of low-fluoride varnishes did not change with increasing of TMP concentration. It was concluded that the low-fluoride varnishes supplemented with TMP presented efficacy against enamel erosion *in vitro*. Financial Support: FAPESP (2009/03869-2 and 2009/16374-1).

Corresponding author: Alberto Carlos Botazzo Delbem. Rua José Bonifácio 1193, Araçatuba-SP, Brazil, 16015-050. Tel: +55-18-3636-3235 - Fax: +55-18-3636-3332 - E-Mail: adelbem@foa.unesp.br

In vitro evaluation of changes in permanent human enamel exposed to energetic drinks

M.S.S. Matumoto[1], A.C.R. Medeiros[2], R.S.S. Terada[2], M.F. Hayacibara[2], A.C. Guedes- Pinto[3]

1- Pediatric Dentist. 2- Departament of Dentistry, State University of Maringá, Brazil. 3- Department of Pediatric Dentistry, School of Dentistry, University of São Paulo, Brazil.

The aim of this study was to verify the erosive potential of energetic drinks sold in the national market. Ten trademarks to evaluate pH and buffering capacity were selected. 30 mL samples from each energetic drink were tested in duplicate in order to obtain a pH average. 50 µL of NaOH aliquots were added to the 30 mL solution until the pH reached 7.0, to measure the buffering capacity. The change in enamel surface hardness was tested for two trademarks. Enamel surface of upper pre-molars were sectioned in the cementoenamel junction and then, in mesio-distal direction, which resulted in two coronary fragments. The specimens were randomly divided into three experimental groups: G1- Control (distilled water), G2- Red Bull® and G3- Red Bull Light® (n=6). Each experimental group was submitted to 5-minute immersion in the energetic drink, with an interval period of 12 hours. The experiment was carried out for 3 days, with a total of 30 minutes of erosive challenges. The percentage of hardness change was calculated using a microhardness device (Knoop Hardness). It was found a low pH in all energy drinks studied, with values raging from 2.1 to 3.2. Regarding buffering capacity, it was found that the base amount required for the neutralization ranged from 1,200 to 3,750 µL. Red Bull® showed pH of 3.1, buffering capacity of 3,500 µL and reduction in enamel hardness of 64%. Red Bull Light® showed pH of 3.0, buffering capacity of 3,750 µL and reduction in enamel hardness of 67%. The tested energetic drinks significantly reduced enamel hardness. There was no significant difference among the energetic drinks tested. It may be concluded that all energetic drinks have potential to promote mineral loss and consequently dental erosion, due to the low pH and high buffering capacity.

Corresponding author: Aline Claudia Ribeiro Medeiros. Rua Osvaldo Cruz, 756, Maringá-PR, Brazil, 87020-200. Tel: +55-44-8815-3160 - E-mail: alineclaudia2006@yahoo.com.br

Effect of calcium lactate on the erosive potential of a soft drink

C.S. Barbosa[1], J.G. Carvalho[1], M.T. Kato[1], M.A.R. Buzalaf[1]

1- Department of Biological Sciences. Bauru School of Dentistry, University of São Paulo, Brazil.

Acidic soft drinks are potentially erosive for dental hard tissues. The aim of this study was to evaluate, *in vitro*, the effect of the addition of calcium lactate (CaLac) on the erosive potential of a citric acid-based commercially available carbonated beverage. Sixty bovine dentin samples (4x4x3 mm) were randomly allocated to five groups (n=12 *per* group), as follows: pure beverage (Sprite Zero, control) or CaLac at 0.5, 1.0, 5.0 or 10.0 mM. The samples were subjected to six pH cycles over a 24-h period. In each cycle, the samples were immersed in pure or modified beverage (1 min) and in artificial saliva (59 min). During the remaining period (18 h), the samples were maintained in artificial saliva. The wear was analyzed by profilometry. Data were analyzed by ANOVA and Tukey's test ($p<0.05$). Mean highest dentin losses (µm, ±SD) were observed for the control group (1.4±0.6), followed by the groups containing 0.5 mM (1.1±0.4) and 1.0 mM Ca (0.9±0.5), which did not significantly differ from control and from each other. The groups supplemented with CaLac at 5.0 and 10 mM presented significantly lesser wear (0.9±0.4 and 0.6±0.3, respectively) when compared to control, but did not significantly differ from each other. Thus, the supplementation of the beverage with high CaLac concentrations was able to significantly reduce its erosive potential on dentin and could be a viable alternative to prevent erosion.

Corresponding author: Carolina Silveira Barbosa. Rua Antônio Xavier de Mendonça, 8-08, Apto 7, Bauru-SP, Brazil, 17012-385. Tel: +55-14-3202-6752 - Cel: +55-11-9560-4533 - E-mail: carolbarbosa@usp.br

Effect of minerals supplementation of a commercial soft drink on dentin erosion

L.P. Comar[1], F.M. Levy[1], L.T. Grizzo[1], B.M. Moron[1], C.M. Souza e Silva[1], M.A.R. Buzalaf[1], A.C. Magalhães[1]

1- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.

Acidic soft drinks are potentially erosive for dental hard tissues. A previous study showed that the modification of an erosive soft drink with low Ca concentration might minimize enamel erosion *in vitro*. So, this *in vitro* study evaluated the effect of calcium, fluoride and phosphate, supplemented alone or in combination, to a commercial citric acid-based carbonated beverage on dentin erosion. Seventy bovine root dentin specimens were randomly allocated to seven groups: pure Sprite Zero (pH 3.11); with 1 mM Ca (calcium lactate, pH 3.22); with 0.047 mM F (NaF, pH 3.08); with 1 mM P ($NaH_2PO_42H_2O$, pH 3.10); 1 mM Ca and 1 mM P (pH 3.18); with 1 mM Ca and 0.047 mM F (pH 3.27); and with 1 mM Ca, 1 mM P and 0.047 mM F (pH 3.25). The specimens were subjected to six pH cycles over a 24 h period. In each cycle, the specimens were immersed in pure or modified beverage (2 min, 30 ml/sample) and in artificial saliva (pH 6.8; 60 min, 30 ml/sample). The specimens were maintained in artificial saliva overnight. Dentin loss was assessed by profilometry (µm). Data were tested using ANOVA and Tukey's tests (α=0.05). Highest dentin loss means were observed in specimens from the pure beverage group (2.53), followed by modified with Ca/P (2.46), P (2.44), Ca/F (2.36), F (2.29) and Ca (2.25). Only the supplementation with all ions (G7: 2.17) showed slightly lower dentin loss compared to control ($p<0.05$). The other groups did not significantly differ from the control. In conclusion, the modification of an erosive soft drink with low concentrations of Ca, P and F, alone or combined, has nearly no impact on its erosive potential.

Corresponding author: Livia Picchi Comar. Al. Octávio Pinheiro Brisolla, 9-75, Bauru-SP, Brazil, 17012-901. Tel: +55-14 -3235-8246 - E-mail: liviacomar@usp.br

Effect of different fluorides on dentin erosion: an *in vitro* study

V.F. Passos[1], A.A. de Vasconcelos[1], J.H.P. Pequeno[1], S.L. Santiago[1]

1- Department of Dentistry, Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará, Brazil.

The prevention of dental wear by intrinsic erosion using fluoride dentifrice is still little known with limited information about the effect of fluoride in toothpastes. The aim of this study was to assess the preventive effect of four commercial dentifrices with different fluorides compounds using an erosion-abrasion *in vitro* model. Fifty human root dentin specimens obtained from third molars were selected by surface microhardness and randomized into five groups (n=10): G1 – control (no F, pH= 7.3); G2 – Elmex (1,400 ppm F as AmF, pH=5.9); G3 – Crest Pro-Health Enamel Shield (1,100 ppm F as SnF2, pH=5.6); G4 – Meridol (1,400 ppm F as AmF/SnF2, pH=6.0) and G5 – Sensodyne Pro-enamel (1,425 ppm F as NaF, pH=7.2). Human dentin specimens were submitted to cycles of demineralization (HCl 0,01 M for 60 s, pH 2.0), remineralization (artificial saliva for 60 min), and immersion in 1:3 w/w of dentifrice/artificial saliva followed by toothbrushing (150 brushing strokes). The described cycle was repeated three times a day for a total of five days. After the end of experimental test, the surface loss was quantified by stylus profilometry and compared among groups. The data were submitted to Kruskal-Wallis and Student-Newman-Keuls tests ($p<0.05$). The wear rates µm (SD) were: G1: 4.1±1.2; G2: 3.7±1.5; G3: 1.3±0.4; G4: 2.1±0.7; G5: 2.3±0.8. There was no significant difference between G1 and G2; however, G3, G4 and G5 were statistically different from the control group. The results suggest that, according the studied conditions, dentifrices containing NaF, SnF2 or AmF/SnF2 can have a preventive effect against root dentin erosion by intrinsic acid.

Corresponding author: Vanara Florêncio Passos. Rua Major Facundo 2105, Centro, Fortaleza-CE, Brazil, 60025-101. Tel/Fax +55-85-3226-6475 - E-mail: vanarapassos@hotmail.com

Comparative adhesion to enamel previously eroded by different drinks

L.C. Casas-Apayco[1], M.C. Giacomini[1], V.D. Manzini[1], A.C. Hipólito[1], E.B. Franco[1], D. Rios[2], A.C. Magalhães[3], L. Wang[1]

1- Department of Operative Dentistry, Endodontics and Dental Materials, Bauru School of Dentistry, University of São Paulo, Brazil. 2- Department of Pediatric Dentistry, Orthodontics and Community Health, Bauru School of Dentistry, University of São Paulo, Brazil. 3- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.

A remarkable increase consumption of beverages with erosive potential has been evidenced. The purpose of this study was to evaluate the bond strength and qualitative aspects of a resin composite to enamel eroded by manufactured orange juice and regular cola drink. Bovine enamel specimens (4x4x2 mm, n=10) were prepared and submitted to erosive challenges with orange juice (OJ) or regular cola (RC), 3x1 min, and remineralization in artificial saliva, until completing 24h of the experiment. These protocols were previously validated to provoke enamel erosion. Control specimens were remained in artificial saliva (AS) for 24 h (n=10). Eight specimens of each group were restored with etch-and-rinse dentin bonding system Adper Single Bond 2 and resin composite Filtek Z350. These specimens were tested by microtensile test using a Universal Testing Machine. Two specimens of each group were restored using the same protocol; however, Single Bond was modified with rodhamine B (0.16 mg/mL) to be analyzed by Confocal Laser Scanning Microscopy. Data of bond strength were submitted to One-way ANOVA and Tukey tests ($p<0.05$, n=8). Bond strength data (MPa) were AS=23.86 (3.55), OJ- 23.11 (3.88) and RC-15.38 (3.82). Only RC was statistically different from AS and OJ. The images for AS revealed a homogeneous tag- formation. On the other hand, both OJ and RC showed particular damaged performances: OJ provoked a superficial layer formation without tags. RC resulted in irregular and superficial tag-formation. Different erosive drinks provoked distinct patterns of hybrid layer, which confirm that erosive demineralization may have implications on adhesion to enamel.

Corresponding author: Linda Wang. Al. Octávio Pinheiro Brisolla, 9-75, Bauru-SP, Brazil, 17012-901. Tel: +55-14-3235-8325 - Fax: +55-14-3227-1486 - E-mail: wang.linda@usp.br

Comparison of profilometric methods in quantification of surface wear by dental erosion/abrasion

A.A. de Vasconcellos[1], V.F. Passos[1], M.A.S. de Melo[1], L.K.A. Rodrigues[1], S.L. Santiago[1]

1- Department of Operative Dentistry, Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará, Brazil.

Profilometry is a well-established technique applied to evaluate the tooth surface loss after erosive and erosive-abrasive challenge often obtained by contact (stylus) and non-contact (optical/laser) methods. The purpose of this study was to assess the application of the focus variation 3D scanning microscopy compared to stylus profilometry for the assessment of dental erosion associated or not to abrasion of the human enamel and dentin. Twenty human root dentin and enamel specimens obtained from third molars were selected by surface microhardness and randomized into four groups (n=10): G1 – only dentin erosion; G2 – dentin erosion plus abrasion; G3 – only enamel erosion and G4 – enamel erosion plus abrasion. Each group was treated with Coca-Cola® for 60 s, followed by a remineralization for 60 min in artificial saliva. In the groups G2 and G4, the specimens were submitted to toothbrushing with 150 brushing strokes. The erosive and abrasive cycles were repeated three times a day for a total of five days. The enamel and dentin superficial loss was measured by two different profilometric analyses, a stylus profilometry and a focus variation 3D scanning microscopy. For each substrate, eroded and eroded-abraded specimens were compared using unpaired t-test. The correlation between the techniques was analysed by Pearson's correlation (α=5%). The mineral loss of groups G3 and G4 was significantly different ($p<0.0001$ for both techniques). However, G1 and G2 did not show significant difference between them ($p=0.21$ to 3D scanning microscopy and $p=0.30$ to stylus profilometer). The results showed that there is a

positive correlation (r=0.69; p=0.007) between contact and no-contact profilometry analyses for enamel. However, a very weak and non-significant correlation between the profilometric results was found for dentin (r=0.08; p=0.73). Although both techniques have showed similar trends between the two conditions for enamel and dentin, it was not found any correlation between the techniques for dentin.

Corresponding author: Andréa Araújo de Vasconcellos. Rua Leonardo Mota, 1001 Apartamento 1200, Aldeota, Fortaleza-CE, 60170-040. Tel: +55-85-3224-7676 - E-mail: andrea.odonto@yahoo.com.br

The effect of brushing eroded human primary enamel using children's toothpastes *in vitro*

R.B.R.A. Sousa[1], V.F. Passos[1], M.A.S. de Melo[1], J.P.M. Lima[1], A.A. de Vasconcelos[1], S.L. Santiago[1], L.K.A. Rodrigues[1], J.J.S. Moreira Neto[1]

1- Department of Operative Dentistry, Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará, Brazil.

Emerging data has suggested that dental erosion became an increasing clinical problem in pediatric dentistry. This study aimed to investigate the effect of brushing enamel eroded, by an orange juice, with three commercially children's toothpaste, using an *in vitro* model. For this, enamel slabs were obtained from primary teeth and then randomly assigned to four groups (n=8) comprising three different toothpastes: G1-control-distillated water; G2-Oragel (no fluoride-containing); G3-Colgate Junior (1,100 ppmF) and G4-Sensidyne Proenamel for Children (1,500 ppm F). Each slab had one half protected in order to provide a control side and the other one was subjected to treatments. The slabs were submitted to erosive challenges (3x/day, 2 min) using a concentrated orange juice (pH 3.38) associated to abrasive challenges using a brushing machine (150 brushing strokes). The rest of the day the slabs were kept in artificial saliva at 37ºC. The cycles were performed during 5 days. Enamel loss was measured by optical profilometry. Enamel loss (µm, means±SD) was for G1-2.5±1.2; G2-3.3±2.1; G3-2.1±1.0 and G4-3.1±1.0. The data were analyzed using ANOVA and Tukey-Kramer test (α=5%). There was significant difference only between the groups G2 and G3. This study suggests that all toothpastes containing fluoride were unable to protect against enamel erosion. Financial Support: CAPES.

Corresponding author: Rebecca Bastos R. Araújo Sousa. Rua Joaquim Nabuco, 1889/400, Fortaleza-CE, Brazil, 60125-120. Tel:+55-85-3264-5063 - Fax:+55-85-3264-0242 - E-mail: rebeccabra@hotmail.com

Prevalence and contributing factors for dental erosion among 6 to 12 year-old children of public and private school

D.F.B. Mangueira[1], F.C. Sampaio[2], A.F.B. Oliveira[3]

1- Department of Restorative Dentistry, Federal University of Paraíba, Brazil. 2- Department of Social and Clinical Dentistry, Federal University of Paraíba, Brazil. 3- Department of Morphology, Federal University of Paraíba, Brazil.

The purpose of this study was to assess the prevalence and contributing factors for dental erosion among 6 to 12 year-old children of public and private schools in the city of João Pessoa/ PB. The sample comprised 983 children. The data were collected by only one calibrated examiner (kappa surface=1.0; kappa severity=0.89; kappa area=0.83). It was applied the dental erosion index proposed by O'Sullivan (2000) adapted and validated by Peres, et al. (2005). Location, grade of severity and the area of the surface affected by the erosion were considered. Guided interviews with parents were applied to search for risk factors. Using a 5% statistical significance, the analysis utilized Chi-square tests, Fisher exact tests and a logistic regression model. The prevalence of dental erosion was evident in 19.9% (n=196) distributed in 57.1% (n=112) of boys and 42.9% (n=84) of girls. In public schools and private schools the prevalence was 43.3% (n=85) and 56.7% (n=111), respectively. Among those presenting dental erosion, the most affected age group was found to be 6 year-old children, 35.2% (n=69). Significant statistical differences were observed between gender (p<0.05), as well as between schools (p<0.05). The highest severity degree was loss of enamel and dentin beyond dentinoenamel junction (ADJ). The palatal surface was the most affected, and processed fruit juice and dentition's type were identified as the major risk factors associated with dental erosion. Therefore, the data indicate a high prevalence of dental erosion across this age span. Dental erosion seems to occur most often among boys with primary dentition who attend private schools and present a high consumption processed (pasteurized) fruit juice. Financial support: CNPq

Corresponding author: Dayane Franco Barros Mangueira. R. Helena Meira Lima, 75, Tambaú, João Pessoa-PB, Brazil, 58039-080. Tel: +55-83-9967-1543 - E-mail: dayanemangueira@gmail.com

Evaluation of *in vitro* erosive potential of carbohydrate-electrolyte drinks on human enamel

M.A.S. Melo[1], V.F. Passos[1], J.P.M. Lima[1], V.B.Rocha[1], Y.L.Barrozo[1], S.L. Santiago[1], L.K.A. Rodrigues[1]

1- Department of Operative Dentistry, Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará, Brazil.

Considering that electrolyte replacement promotes proper rehydration, which is important in delaying the onset of fatigue during exercise, the consumption of carbohydrate-electrolyte beverages has significantly increased by exercise practitioners. However, the frequent intake of these drinks during training can lead to dental erosion. The present study intended to analyze the erosive potential of different types of drinks on human enamel covered or not by artificial acquired pellicle, as follows (n=10): G-Gatorade®; S- SUUM®; T- Taeq®; CC- Commercial coconut water and NC- Natural coconut water. The pH and titratable acidity from the beverages were determined as well as their demineralizing capacity assessed by tissue and surface hardness losses. One third of each slab was protected and used as reference surface; the second third was submitted to a previous 24 hour-acquired pellicle formation and subsequently, to cyclic erosive challenge together with the other third. Erosive cycles were performed by immersions in the beverages and artificial saliva (5 min in each solution) totalizing 2 hours. Erosive alterations were measured by microhardness analysis and profilometry. ANOVA and Tukey tests were used to compare the percentage of surface hardness loss (SHL) and tissue wear. The effect of acquired pellicle was determined by paired t test. The range of pH and titratable acidity were, respectively, 2.85-4.81 and 250-1700 µL of 1 N NaOH. The highest erosive potential was found for G and T (70,42 and 71,90% SHL; 2,08 and 1,11 µm), intermediate results were obtained for S (35,75%; 1,16 µm) and the lowest ones for CC and NC (6,53 and 8,55%; 0,47 and 0,32 µm) (p<0.05). Artificial acquired pellicle did not provide protection against erosion (p>0.05). Considering the limitations of this *in vitro* study, it can be concluded that isotonic drinks such as Gatorade and Taeq can cause dental erosion, which is not significantly decreased by artificial acquired pellicle presence.

Corresponding author: Mary Anne Sampaio de Melo. Cap. Francisco Pedro S/N - Rodolfo Teófilo, Fortaleza-CE, Brazil. 60430-170. Tel: +55-85-3366-8232 - Fax: +55-85-3366-8232 - E-mail: maryannesmelo@yahoo.com

Factors involved with Dental Erosion and its impact on the quality of life of cerebral-palsied children

J. Abanto[1], T.S. Carvalho[1], C. Murakami[1], A.L Ciamponi[1], M. Bönecker[1]

1- Department of Pediatric Dentistry, School of Dentistry University of São Paulo, Brazil.

The aim of this cross-sectional study was to assess the factors involved with Dental Erosion (DE) and its impact on the Oral Health Related Quality of Life (OHRQoL) of children with Cerebral Palsy (CP) and of their parents. All 60 children with Cerebral Palsy (CP) of both genders, aged between 6 and 14 years, from the Center

of Treatment for Special Care Patients (CAPE) at the School of Dentistry, University of São Paulo participated in this study. The children were examined by a trained and calibrated dentist for DE diagnosis using the O'Brien index (1994) (Kappa=0.90), and for Dental Caries, using the dmf-t and DMF-T scores (Kappa=0.95); the latter was used to adjust the analysis. Two questionnaires were applied to the parents of the children: one on dietary/behavioral factors related to DE and one (Child Oral Health Quality of Life Questionnaire) on the OHRQoL. Children were classified according to the presence of DE. Dental Caries was analyzed similarly to DE. The total score of the OHRQoL questionnaire was obtained for each child. Poisson Regression Analyses were carried out to correlate erosion (outcome) to dietary/behavioral factors, and also to correlate the overall OHRQoL score to the oral conditions and family income. It was found that children with CP who drank more soft drink (RR=1.86; 95%CI: 1.24–2.80; p=0.003), and powdered juice (RR=3.26 95%CI: 1.54–6.89; p=0.002) or who presented reflux (RR=1.57; 95%CI: 1.09–2.28; p=0.016) presented significantly more DE. Also, the presence of DE (RR=0.65; 95%CI: 0.49–0.86; p=0.003) and greater family income (RR=0.36; 95%CI: 0.22–0.57; p<0.001) caused less impact on the OHRQoL of CP children. Presence of DE was related to soft drink and powdered juice ingestion, as well as gastro-esophageal reflux, but DE did not cause a negative impact on the quality of life of children with Cerebral Palsy.

Corresponding author: Jenny Abanto. Avenida Professor Lineu Prestes, 2227, Cidade Universitária, São Paulo-SP, Brazil, 05508-000. Tel: +55-11-3091-7835 - E-mail: jein11@hotmail.com

Effect of whitening mouthwashes associated with toothbrushing abrasion on human dentin *in vitro*

J.P.M. Lima[1], V.F. Passos[1], M.A.S. de-Melo[1], C.L.N. Braga[1], S.L. Santiago[1], N.A.P. Nogueira[2]; L.K.A. Rodrigues[1]

1- Department of Dentistry, Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará, Brazil. 2- Department of Pharmacy, Faculty of Pharmacy, Dentistry and Nursing, Federal University of Ceará, Brazil.

Due to the increase of non-carious cervical lesions caused by erosive challenges, with exposure of dentinal tubules and hypersensitivity, concerns about freely marketed-whitening mouthwash effects are rising. This study evaluated the possible erosive potential of whitening mouthwashes associated with toothbrushing abrasion on root dentin. Thirty human root dentin specimens were randomly allocated into three groups (n=10): G1–deionized water (pH 7.27, control), G2–Whitening Plax (1.5% hydrogen peroxide, pH 3.78) and G3–Listerine Whitening (2.0% hydrogen peroxide, pH 5.52). Each specimen was partly covered with nail varnish, exposed to the water or mouthwashes to simulate erosive challenges followed by an abrasion cycle model. The specimens were independently immersed in 3 ml of the solutions under agitation at room temperature (2 times/day, 60 s). For G2, further immersion was performed after each brushing cycle (60 s each), as it is advised by the mouthwash's manufactory. The abrasive cycles were carried out 3 times/day during 10 days, using a brushing machine (36 s, 150 strokes), where the specimens were bathed in slurry of fluoride toothpaste and artificial saliva. Between the erosive-brushing cycles, the samples were stored in artificial saliva at 37ºC. Dentin loss was analyzed by focus variation 3D microscopy and data submitted to ANOVA (p<0.05). The wear rates (µm) were 1.4±0.4; 1.8±0.6; and 1.5±0.2 for G1 to G3, respectively. No significant differences were found among the groups (p=0.17). According to the conditions of the study, it can be concluded that the tested whitening mouthwashes, when associated to brushing procedures, did not increase the dentin loss.

Corresponding author: Juliana Paiva Marques Lima. Rua Cap. Francisco Pedro S/N, Rodolfo Teófilo, Fortaleza-CE, Brazil, 60430-170. Tel/Fax: +55-85-3366-8232 - E-mail: julianapml@yahoo.com.br

A comparative study of morphological adhesive interface between NCCL and sound teeth with CLSM and SEM

M.P. Calabria[1], L.M. Silva[1], L.F. Francisconi[1], K.C.S. Modena[1], L.C. Casas-Apayco[1], F.P.S. Nahsan[1], L. Wang[1], M.T. Atta[1], J.C. Pereira[1]

1- Department of Operative Dentistry, Endodontics and Dental Materials, Bauru School of Dentistry, University of São Paulo, Brazil.

Non-carious cervical lesions (NCCL), found on the cervical tooth area, are related to erosion, abrasion or abfraction condition. Many studies have shown that restoration of NCCL have inadequate retention rates with high failure percentage. Hybrid layer (HL) characteristics are apparently affected by dentin substrate. The aim of this study was to analyze qualitatively the morphological characteristics of the adhesive interface in NCCL (n=5) compared to young (n=5) and old (n=5) sound teeth. After extractions, teeth (n=15) were stored in 0.1% thymol solution. Cavities (2 mm deep, 4 mm wide) simulating NCCL were prepared on vestibular and lingual surfaces of young (±18-years) and old (over 47-years) sound teeth and on lingual surfaces of teeth with NCCL. All cavities were restored with the adhesive system Adper Single Bond (3M/ESPE), previously stained with rhodamine B, and composite resin (Filtek Z350-3M/ESPE). After root segments removal, the cervical areas were longitudinally sectioned. Each half was analyzed in Scanning Electron Microscope (SEM) and the corresponding half in Confocal Laser Scanning Microscope (CLSM). Microscopy showed that the NCCL surfaces presented a different standard of adhesive interface in relation to the surface of young and old sound teeth as well as the vestibular and the lingual surface. An irregular formation of HL and the absence of resin tags or small tags with erratic distribution on the buccal surface of teeth with NCCL were observed. On the lingual surface of NCCL teeth, the HL was uniform but tags formation was deficient. In sound old and young teeth the HL was uniform and with long resin tags. The old teeth presented less tags compared to the young teeth. It seems that the quality of mechanical linking between adhesive system and dentin can be compromised due to morphological characteristics of the dentin substrate in NCCL.

Corresponding author: Marcela Pagani Calabria. Al. Octávio Pinheiro Brisolla, 9-75, Bauru-SP, Brazil, 17012-901. Tel/Fax: +55-14-3235-8323 - E-mail: marcela_calabria@yahoo.com.br

Initial pH and titratable acidity of powdered juices commercialized in Brazil

C.M. Ramirez[1], T.S. Carvalho[1], M. Bönecker[1]

1- Department of Pediatric Dentistry, School of Dentistry, University of São Paulo, Brazil.

The aim of this *in vitro* study was to assess the erosive potential of different powdered juices commercialized in Brazil by measuring their initial pH and titratable acidity. Three flavors (Grape, Orange and Strawberry) of different brands of powdered juices (Tang®, MID®, Camp®) were chosen. The juices were prepared according to the manufacturer, and 1 mL samples (n=10) from each juice were analyzed. Using a pH-meter, the initial pH for each sample was measured, then known quantities of 0.01 M NaOH was added to the sample until pH 7,0 was reached. Then, the final concentration (concNaOH) of NaOH necessary to change the pH to 7 was calculated (mmol of NaOH *per* liter of test solution). The same procedure was carried out using Coca-Cola® (CC), to compare the juices to a known erosive agent. Friedman and post-hoc Wilcoxon signed ranks tests were used to analyze differences in pH and concNaOH between the flavors and the brands. Mann-Whitney test was used to compare the juices and CC. The mean (±sd) CC pH was 2.15(±0.13), where CC had significantly lower pH than the juices (p<0.05). The mean pH for the juices varied significantly (p<0.05), from 2.61 (for Camp® Orange) to 3.05 (Camp® Grape). The mean (±sd) concNaOH for CC was 22.7(±3.7), where CC had significantly lower concNaOH than all juices (p<0.05). The mean concNaOH for the juices varied significantly (p<0.05), from 19.0 (for Camp® Grape) to 47.8 (for MID® Strawberry). Although Coca-Cola®'s pH was significantly lower than the juices, the latter present significantly higher titratable acidity.

Corresponding author: Carolina M. Ramirez. Avenida Professor Lineu Prestes, 2227, Cidade Universitária, São Paulo - SP, Brazil, 05508-000. Tel: +55-11-3091-7835 - E-mail: carolmayumi@hotmail.com

Direct composite restoration of an extensively eroded dentition associated with carious lesions: a case report

L.F. Francisconi[1], K.C.S. Modena[1], L.C. Casas-Apayco[1], L.M. Silva[1], F.P.S. Nahsan[1], M.P. Calabria[1], P.A.S. Francisconi[1], M.T. Atta[1], J.C. Pereira[1]

1- Department of Operative Dentistry, Endodontics and Dental Materials, Bauru School of Dentistry, University of São Paulo, Brazil.

Tooth erosion, a dental wear by acid and/or chelation without bacterial involvement, can cause high substance loss, resulting in the necessity of oral rehabilitation. Composites are being used for reestablishing eroded tooth structure, function and aesthetics, as well as for controlling hypersensitivity. Although oral rehabilitation with direct restorations is rather widespread, this is a challenging procedure. This case report describes a successful direct composite restoration of a typical distribution of erosion, associated to carious lesions. The affected buccal and occlusal surfaces of the second premolar and molars in the left side of the mandible were restored with a microhybrid composite (Filtek Z250®), after roughening of tooth surfaces, acid etching and adhesive system (Adper Single Bond 2®) application. The same was performed for the right side of the mandible, in a second session. The affected palatal and occlusal surfaces of all posterior teeth in the maxilla were equally restored in the third and fourth sessions, concomitantly to the treatment, with calcium hydroxide cement, lining glass ionomer and composite resin, of the class II carious lesions in the first left and both second premolars. Occlusal vertical dimension, nearly unaffected by erosion, was determined clinically, focusing on patient comfort. In a fifth session, the superior anterior teeth were restored with an aesthetic composite system (Esthet-X®), using a silicon guide obtained from the waxing of the patient's plaster model. After finishing and polishing, the performed treatment satisfied both the patient and the professionals' expectations. The patient was informed on ways to prevent dental erosion and control visits were planned, since these measures are imperative to the success of cases like the one reported. When properly indicated, direct composite restorations can be, therefore, a viable treatment modality for functional and esthetic rehabilitation of extensively eroded dentitions associated to carious lesions, as it could be observed.

Corresponding author: Luciana Fávaro Francisconi. Al. Octávio Pinheiro Brisolla, 9-75, Bauru-SP, Brazil, 17012-901. Tel: +55-14-3235-8263 - Fax: +55-14-3226-1495 - E-mail: luff@usp.br

Toothpastes with MMP inhibitors reduce dentin erosion and abrasion *in situ*

M.T. Kato[1], A.R. Hannas[1], A. Bolanho[1], A.C. Magalhães[1], J.C. Pereira[1], L. Tjäderhane[2], M.A.R. Buzalaf[1]

1- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil. 2- Institute of Dentistry, University of Oulu; and Oulu University Hospital, Finland.

The use of gels and mouthrinses with MMP inhibitors (chlorhexidine and green tea extract) was shown to prevent dentin erosive wear. The aim of this study was to analyze the protective effect of toothpastes containing MMP inhibitors on dentin wear induced by combined erosive (ERO) and abrasive challenges (ERO+ABR) in an *in situ* crossover model. Ten adult volunteers wore palatal devices containing bovine dentin slabs randomly allocated to 4 groups (n=20/group), according to the type of toothpaste. The toothpastes had identical composition, except for the presence of 0.61% green tea extract (EGCG), 0.12% chlorhexidine (CHX), 1,100 ppm fluoride (NaF, positive control) or not (placebo, negative control). The specimens were subjected to erosion by immersion in a cola drink (pH 2.6, 5 min) *ex vivo*, 4 times a day, for 5 days. After the first and last erosive challenges, all specimens were exposed to slurry of respective toothpaste and water (1:3) for 15 s. Additionally, half of the specimens were abraded using an electric toothbrush (ERO+ABR). Volunteers then brushed their teeth with the corresponding toothpastes. Dentin wear was determined using profilometry (µm). Data were analyzed by 2-way repeated measures ANOVA followed by Bonferroni's test ($p<0.05$). Abrasion combined with erosion (ERO+ABR) led to significantly higher wear compared to erosion (ERO) alone ($p=0.001$). All tested toothpastes led to significantly lesser wear when compared to placebo ($p=0.001$). The mean wear (±SD) was: Placebo (ERO: 1.3±0.3; ERO+ABR: 1.7±0.2); EGCG (ERO: 0.8±0.2; ERO+ABR: 1.0±0.3); CHX (ERO: 1.0±0.1; ERO+ABR: 0.8±0.2); NaF (ERO: 0.7±0.3; ERO+ABR: 0.9±0.3), but no significant differences were observed among them. It can be concluded that toothpastes containing MMP inhibitors or fluoride are effective in reducing dentin erosion. Financial support: FAPESP (07/08389-3 and 07/04209-0) and CNPq (557863/2008-2).

Corresponding author: Melissa Thiemi Kato. Al. Octávio Pinheiro Brisolla, 9-75, Bauru-SP, 17012-901, Brazil. Tel: +55-14-3235-8246 - Fax: +55-14 -3227-1486 - E-mail: thiemikato@usp.br

Effect of a cross linker and a metalloproteinase inhibitor on dentin erosion

A. Bolanho[1], M.T. Kato[1], A.R. Hannas[1], J.C. Pereira[1], A.C. Magalhães[1], L. Tjäderhane[2], M.A.R. Buzalaf[1]

1- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil. 2- Institute of Dentistry, University of Oulu; and Oulu University Hospital, Finland.

The degradation of organic material in dentin by matrix metalloproteinases (MMPs) is expected to have a great impact on the erosive lesions. Because of this, the aim was to analyze the effect of tannic acid (TA), a collagen cross-linking agent, and chlorhexidine (CHX), a matrix metalloproteinase inhibitor, on dentin erosion. The hypothesis tested was that the pre-treatment with 20% TA, 0.12% CHX or the combination of both would influence enzymatic degradation of demineralized dentin matrix. Bovine dentin slabs (n=55) were demineralized in 10% phosphoric acid for 5 h. Nail varnish was applied on both sides of the surface of each sample to maintain a reference surface for wear determination. Samples were randomly divided into 5 treatment groups: negative control (distilled water), positive control (1,100 ppmF, as NaF), 20% TA, 20% TA+0.12% CHX and 0.12% CHX. TA and CHX were dissolved in distilled water. Specimens were kept in the treatment solutions for 1 h, thoroughly rinsed, and then subjected to enzymatic challenge for 24 h with bacterial collagenase (Clostridium hystoliticum, 100 U/mL) in an ammonium bicarbonate buffer (pH 9.5). Dentin erosion was assessed by profilometry. Data were analysed by ANOVA and Tukey's test ($p<0.05$). The mean wear (±SD, µm) found for NaF (2.28±0.56) was not significantly different from control (2.24±0.48). Both TA (1.66±0.60) and CHX (1.52±0.43) were able to significantly reduce the wear, but no synergistic effect was detected for their combination (1.54±0.34). Thus, dentin treatment with TA, CHX or their combination decreased collagenase digestion of the organic matrix and might be useful to reduce erosion.

Corresponding author: Angela Bolanho. Al. Octávio Pinheiro Brisolla, 9-75, Bauru-SP, Brazil, 17012-901. Tel: +55-14-3235-8346 - Fax: +55-14 -3227-1486 - E-mail: angelabblumer@yahoo.com.br

Effect of experimental xylitol varnishes and solutions on dentin erosion *in vitro*

J.A. Bressanim[1], G.L. Baptista[1], A.F.F. Pereira[2], T.C. Silva[1], A.C. Magalhães[2], M.A.A.M Machado[1], M.A.R Buzalaf[2], D. Rios[1]

1- Department of Pediatric Dentistry, Orthodontics and Community Health. 2- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.

This *in vitro* study aimed to analyze the effect of applications of 10% and 20% xylitol varnishes and solutions to protect against dentin erosion. Twelve bovine root dentin specimen (4x4 mm) were treated with NaF-Duraphat varnish (2.26%F, pH 4.5, Colgate-Brazil), 10% xylitol varnish (pH 5.0, FGM-Brazil), 20% xylitol varnish (pH 5.0, FGM-Brazil), placebo varnish (pH 5.0, FGM-Brazil), NaF solution (2.26%F, pH 4.5), 10% xylitol solution (pH 6.5) or 20% xylitol solution (pH 6.5). The varnishes and solutions were applied for 6 h and 1 min, respectively. Controls remained untreated. All specimens were then subjected to an erosive demineralizing (Coca-Cola, pH 2.3, 4x90 s/day) and remineralizing (artificial saliva, between the erosive cycles, 2 h, pH 6.8) cycling for 10 days. After 5 days, the varnishes and solutions were reapplied. Dentin loss was measured profilometrically (µm) after the 5th and 10th day. The data were statistically analyzed by ANOVA and Tukey's post-hoc test ($p<0.05$). After the 5th day, all varnishes (NaF-Duraphat: 1.8±0.5, 10% xylitol: 2.1±0.3 and 20% xylitol: 2.1±0.4) and NaF solution (2.0±0.4) significantly reduced dentin loss compared to the control (2.8±0.2) and placebo varnish (2.8±0.2). After the reapplication followed by 5 more days of erosive pH-cycling, only NaF-Duraphat (1.9±0.2) and xylitol varnishes (2.0±0.3 and 2.0±0.3 for 10 and 20%, respectively) could significantly reduce dentin loss compared to control (2.7±0.2) and placebo varnish (2.6±0.3). Xylitol varnishes, regardless the concentration, have presented similar efficacy to a commercial NaF varnish against dentin erosion. Thus, all varnishes seem to be a good option to partially reduce dentin erosion. Financial support: FAPESP (2009/00421-0).

Corresponding author: Daniela Rios. Al. Octávio Pinheiro Brisolla, 9-75. Bauru-SP, Brazil, 17012-901. Tel: +55-14-3235-8224; +55-14-3235-8218 - Fax: +55-14-3227-1486 - E-mail:daniriosop@yahoo.com.br

The effect of mouthwashes containing biguanides on dentin erosion

R. Fukushima[1], S. Charone[2], P. Ducati[2], G. Gennaro[2], M.T. Kato[2], A.C. Magalhães[2], M.A.R. Buzalaf[2]

1- Department of Research and Development, Sanifill, Brazil. 2- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.

Collagen type I is the major organic component of dentin and its stability may have a substantial impact on the degradation of the organic matrix. Chlorhexidine (CHX) has been reported to inhibit matrix metalloproteinases (MMPs) but the potential of other biguanides to reduce dentin wear has not been tested yet. This study aimed to analyze the effect of biguanides (polyhexamethylene biguanide - PHMB and CHX) on dentin wear. The hypothesis tested was that the pre-treatment with 0.07% PHMB or 0.12% CHX would influence enzymatic degradation of demineralized dentin matrix. Bovine dentin blocks (n=80) were demineralized in 10% phosphoric acid for 5 hours, which led to a mean (±SD) dentin loss of 42.2±3.0 µm. Nail varnish was applied on both sides of the surface of each sample to maintain a reference surface for wear determination. Specimens were randomly divided into 4 treatment groups: negative control (distilled water), positive control (0.12% CHX), solution of 0.07% PHMB and Sanifill Premium® (0.07% PHMB plus 0.05% NaF). Specimens were kept in the treatment solutions for 1 min, thoroughly rinsed, and then subjected to enzymatic challenge for 24 hours with bacterial collagenase (100 µg/mL). Dentin loss was assessed by profilometry (µm). The data were analyzed by ANOVA and Tukey's test ($p<0.05$) after log transformation. The mean dentin loss (±SD, µm) found for the 0.07% PHMB solution (7.4±1.4) was not significantly different from the negative control (8.6±1.3). Both Sanifill Premium® (4.2±0.6) and CHX (3.5±0.9) were able to significantly reduce the wear. The results suggest that PHMB is not able to reduce dentin erosion as CHX, and the protective effect of Sanifill Premium® might be due to the presence of fluoride in its formulation.

Corresponding author: Rejane Fukushima. Rua João Alves, 160, CIC, Curitiba-PR, Brazil, 81350-110. Tel: +55-41-3239-6331 - Fax: +55-41-3239-6332 - E-mail: rejane.fukushima@sanifill.com.br

Effect of experimental xylitol containing toothpaste on dentin erosion and abrasion *in vitro*

M.C. Jordão[1], G.L. Baptista[1], J.A. Bressanim[1], A.F.F. Pereira[2], T.C. Silva[1], A.C. Magalhães[2], M.A.A.M Machado[1], M.A.R Buzalaf[2], D. Rios[1]

1- Department of Pediatric Dentistry, Orthodontics and Community Health, University of São Paulo, Brazil. 2- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.

Xylitol seems to be able to complex with calcium ions, penetrate into the demineralized surfaces and reduce the calcium and phosphate ions diffusion coefficient to the outside of the lesion. This *in vitro* study aimed to analyze the effect of xylitol containing toothpaste to protect against dentin erosion associated or not with abrasion. Sixty bovine root dentin specimens were submitted to erosion (E) or erosion plus abrasion (E+A) for 7 days, testing the following toothpastes: Crest (Procter & Gamble, NaF, 1,030 ppm F, pH 6.8), 10% xylitol (Daudt, Brazil, pH 7.0); and placebo (Daudt, Brazil, pH 7.0). All toothpastes present silica as abrasive. The erosive challenges were performed 4 times a day (2 min, Coca-Cola, pH 2.3). The specimens were exposed to the slurries of toothpastes (1:3 water) 2 times daily (15 s, 0,5 mL), after the first and the last erosive challenges. Additionally, during the toothpaste treatment, half of the specimens per group were abraded using an electrical toothbrush (Colgate Motions Multi-action, F=1.5 N). Between the erosive challenges, the specimens were remineralized by artificial saliva (pH 6.8). Dentin loss was measured profilometrically (µm). The data were statistically analyzed by two-way ANOVA and Bonferroni's post-hoc test ($\alpha=0.05$). Only Crest toothpaste (3.00±0.18/E and 2.74±0.13/E+A) significantly reduced dentin erosion and erosion plus abrasion compared to placebo toothpaste (3.38±0.24/E and 3.41±0.27/E+A). However, on both conditions 10% xylitol toothpaste (3.43±0.23/E and 3.43±0.24/E+A) promoted similar wear to placebo toothpaste. All the studied toothpastes induced similar dentin loss when eroded specimens were abraded compared to only eroded specimens. Based on the results, 10% xylitol toothpaste was not able to reduce dentin loss by erosive-abrasive challenges. Financial support: FAPESP (2009/00811-3)

Corresponding author: Daniela Rios. Al. Octávio Pinheiro Brisolla, 9-75. Bauru-SP, Brazil, 17012-901. Tel: +55-14-3235-8224; +55-14-3235-8218 - Fax: +55-14-3227-1486 - E-mail:daniriosop@yahoo.com.br

Effect of a dentifrice containing iron associated or not with fluoride on enamel erosion and abrasion

F.M. Italiani[1], L.T.G. Thomassian[1], M.A.R. Buzalaf[1]

1- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.

The aim of this *in vitro* study was to evaluate a dentifrice containing iron (Fe+2), associated or not with fluoride, to prevent enamel erosion associated to abrasion. Two hundred bovine enamel slabs were distributed into 10 groups according to the dentifrice type: (A) Crest® (1,100 ppm F-, NaF, positive control), (B) F- (1,100 ppm, NaF); (C) 1.0 mg/g Fe+2; (D) 2.5 mg/g Fe+2; (E) 5.0 mg/g Fe+2; (F) F- (1,100 ppm, NaF) + 1.0 mg/g Fe+2; (G) F- (1,100 ppm, NaF) + 2.5 mg/g Fe+2; (H) F- (1,100 ppm, NaF) + 5.0 mg/g Fe+2; (I) Placebo (no F- and no Fe+2); (J) Not brushed, no dentifrice (negative control). The enamel slabs were submitted to 5 de-remineralization cycles combined to abrasion with electrical toothbrush. Each cycle was performed by immersion in Coca-Cola™ (10 mL/slab, 5 min), washing in deionized water (20 s), brushing with slurries (1:3) of the dentifrices in water

(1.96 N load for 30 s), washing in deionized water (20 s) and remineralization in artificial saliva (55 min). The enamel loss was measured by profilometry (µm). Data were analyzed by ANOVA and Tukey's test ($p<0.05$). Dentifrice containing F- (1,100 ppm, NaF) + 5,0 mg/g Fe+2 lead to the lowest enamel loss (0.48±0.24 µm) compared to groups A (0.95±0.31 µm), B (0.93±0.54 µm), D (1.09±0.48 µm), F (0.83±0.32 µm), G (0.91±0.34 µm) and I (1.6±0.53 µm) with reductions in wear ranging between 48 and 55%. Among the other treatments it was not observed significant differences ($p<0.0001$). The results suggest that the incorporation of 5.0 mg/g Fe+2 in fluoridated dentifrices might increase their protection against enamel wear. Financial support: FAPESP. Process Number: 06/04605-0.

Corresponding author: Flávia de Moraes Italiani. Av. das Emas, 163, Itu-SP, Brazil, 13300-000. Tel: +55-11-4023-2992; +55-11-7624-5058 - E-mail: flaviaitaliani@uol.com.br

Effect of experimental pastes with calcium phosphate nanoparticles plus fluoride on the dentin erosion/abrasion *in vitro*

B.M. Moron[1], C.M. Souza-e-Silva[1], L.P. Comar[1], S.S. Miyazaki[1], M.A.R. Buzalaf[1], A.C. Magalhães[1]

1- Departament of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.

This *in vitro* study evaluated the preventive potential of experimental bioactive formulations based on innovative technology of calcium phosphate nanoparticles (Nanop) plus high fluoride (F) concentration on dentin erosion-abrasion. Bovine dentin specimens were divided into 7 groups: control (untreated), placebo paste, Nanop paste (20% Ca/P), Nanop paste plus (20% Ca/P + 2% NaF), fluoride paste (2% F), MI paste (10% CPP-ACP) and MI paste plus (10% CPP-ACP + 0,2% NaF). Ten specimens in each group were subjected to an erosive demineralization (Coca-cola, pH 2.3) for 90 s, 4 times a day. Additionally, the specimens were abraded using an electrical toothbrush (Colgate Motions Multi-action, F=1.5 N) and slurry of no-F toothpaste (1:3 water, 0,5 mL/specimen) for 10 s, 2 times daily, after the first and last erosive challenges. After the abrasion, the specimens were submitted to the treatments. The pastes were applied using microbrush for 3 min, and the excess was removed with a cotton swab. Between the erosive and abrasive challenges, the specimens were remineralized by artificial saliva (pH 6.8). Dentin loss was measured profilometrically (µm) after 5th day. The date were statistically analyzed by Kruskal-Wallis and Dunn`s test ($p<0.05$). The only treatments able to significantly reduce the dentin loss were Nanop paste plus (1.68±0.40) and F paste (1.89±0.32) compared with control (6.63±0.96) and placebo paste (6.47±1.51), which in turn did not significantly differ from the other groups (Nanop paste: 4.78±0.53, MI paste: 5.71±0.42, MI paste plus: 6.88±0.62). The results suggest that the presence of high F concentration improves the effect of Nanop paste on the prevention of dentin erosion-abrasion. Financial support: FAPESP 2009/08748-9.

Corresponding author: Bruna Mangialardo Moron. Al. Octávio Pinheiro Brisolla, 9-75. Bauru-SP, Brazil, 17012-901. Tel: +55-14-3235-8346 - Fax: +55-14-3227-1486 - E-mail: brumoron@usp.br

Effect of different fluoride concentrations in dentifrices on enamel erosion-abrasion *in vitro*

S.S. Miyazaki[1], B.M. Moron[1], C.M. Souza e Silva[1], L.P. Comar[1], F. Vilhena[1], A.C. Magalhães[1], M.A.R. Buzalaf[1]

1- Department of Biological Sciences, Bauru School of Dentistry, University of São Paulo, SP, Brazil.

This *in vitro* study analyzed the effect of increasing F concentration (550-5,000 ppm F) and of the viscosity (liquid versus paste) of dentifrices to protect against enamel erosion-abrasion. Seventy bovine enamel specimens were randomly allocated to the following dentifrices: liquid dentifrice with 550 ppm F, commercial toothpaste with 550 ppm F (Barney-Baby, Colgate), liquid dentifrice with 1,100 ppm F, commercial toothpaste with 1,100 ppm F (Crest, Procter & Gamble), liquid dentifrice with 5,000 ppm F, commercial toothpaste with 5,000 ppm F (Duraphat, Colgate) and placebo liquid dentifrice. During 7 days, the specimens were subjected to an erosive demineralization (Sprite zero, pH 2.8) for 90 s, 4 times a day. Additionally, the specimens were abraded by toothbrushing using one of the dentifrices and electrical toothbrushing, for 15 s, 2 times a day, after the first and the last erosive challenges. Between the erosive and abrasive challenges, the specimens were remineralized by artificial saliva (pH 6.8). Enamel loss was measured profilometrically (µm). Data were analyzed by ANOVA followed by Tukey's test ($\alpha=0.05$). Regarding the F concentration, only liquid dentifrices with 5,000 ppm F (6.09±0.80) significantly reduced enamel erosion-abrasion compared to the other dentifrices, which in turn did not significantly differ from each other. In respect to viscosity, only for dentifrices with 550 and 5,000 ppm F, liquids (7.93±0.50; 6.09±0.80, respectively) performed better than pastes (9.60±0.71; 8.41±0.88, respectively), even they were not effective to protect against enamel loss, except for 5,000 ppm F. Thus, it can be concluded that only high fluoride liquid dentifrices seems to be a good option to reduce enamel loss by mild erosive-abrasive challenges *in vitro*.

Corresponding author: Bruna Mangialardo Moron. Al. Octávio Pinheiro Brisolla, 9-75. Bauru-SP, Brazil, 17012-901. Tel: +55-14-3235-8346 - Fax: +55-14-3227-1486 - E-mail: brumoron@usp.br

The impact of experimental pastes with 10% and 20% calcium phosphate nanoparticles alone or combined with fluoride on dentin erosion/abrasion *in vitro*

C.M. Souza-e-Silva[1], B.M. Moron[1], C.A.B. Cardoso[1], A.C. Magalhães[1], M.A.R. Buzalaf[1]

1- Departament of Biological Sciences, Bauru School of Dentistry, University of São Paulo, Brazil.

This *in vitro* study evaluated the preventive potential of experimental pastes with 10% and 20% calcium phosphate nanoparticles (Nanop) alone or combined with fluoride (F) on dentin erosion-abrasion. Bovine dentin specimens were divided into 9 groups: control, 10 Nanop paste (10% Ca/P), 10 Nanop paste plus F (10% Ca/P+0,2% NaF), 20 Nanop paste (20% Ca/P), 20 Nanop paste plus F (20% Ca/P+0,2% NaF), placebo paste, fluoride paste (0.2% NaF), MI paste (10% CPP-ACP) and MI paste plus F (10% CPP-ACP+0,2% NaF). Ten specimens in each group were subjected to an erosive demineralization (Coca-cola®, pH 2.3) for 90 s, 4 times a day. Additionally, the specimens were abraded using an electrical toothbrush (Colgate Motions Multi-action, F=1.5 N) and slurry of no-F toothpaste (1:3 water, 0,5 mL/specimen) for 10 s, 2 times daily, after the first and last erosive challenges. After the abrasion, the specimens were submited to the treatments. The pastes were applied using microbrush for 3 min, and the excess was removed with a cotton swab. Between the erosive and abrasive challenges, the specimens were remineralized in artificial saliva (pH 6.8). Dentin loss was measured profilometrically (µm) after 5th day. The date were statistically analyzed by Kruskal-Wallis and Dunn's test ($p<0.05$). The treatments 10 Nanop paste plus F (4.13±0.63), 20 Nanop paste plus F (4.61±0.60) and F paste (3.24±0.64) were able to significantly reduce dentin loss compared with control (6.63±0.96) and placebo paste (6.47±1.51), which in turn did not significantly differ from the other groups (10 Nanop: 5.19±1.44; 20 Nanop: 4.78±0.53; MI paste: 5.71±0.42; MI paste plus F: 6.88±0.62). The results suggest that the addition of fluoride to the Nanop paste has a positive effect on the prevention of dentin erosion-abrasion. Financial support: FAPESP 2009/08748-9.

Corresponding author: Cíntia Maria de Souza e Silva. Al. Octávio Pinheiro Brisolla, 9-75. Bauru-SP, Brazil, 17012-901. Tel: +55-14-3235-8346 - Fax: +55-14-3227-1486 - E-mail: cintia-ours@usp.br

Effect of experimental pastes with calcium phosphate nanoparticles plus fluoride on the enamel erosion/abrasion *in vitro*

C.A.B. Cardoso[1], C.M. Souza-e-Silva[1], B.M. Moron[1], S.S. Miyazaki[1], L.P. Comar[1], A.C. Magalhães[1], M.A.R. Buzalaf[1]

1- Departament of Biological Sciences , Bauru School of Dentistry, University of São Paulo, Brazil.

This *in vitro* study evaluated the preventive potential of experimental bioactive formulations based on innovative technology of calcium phosphate nanoparticles (Nanop) plus high fluoride (F) concentration on enamel erosion-abrasion. Bovine enamel specimens were randomly divided into 7 groups: control (untreated), placebo paste, Nanop paste (20% Ca/P), Nanop paste plus (20% Ca/P+2% NaF), F paste (2% NaF), MI paste (10% CPP-ACP) and MI paste plus (10% CPP-ACP+0,2% NaF). Ten specimens in each group were subjected to an erosive demineralization (Coca-cola®, pH 2.3, 30 mL/specimen) for 90 s, 4 times a day. Additionally, the specimens were abraded using an electrical toothbrush (Colgate Motions Multi-action, F=1.5 N) and slurry of no-F toothpaste (1:3 water, 0.5 mL/specimen) for 10 s, 2 times daily, after the first and last erosive challenges. After the abrasion, the specimens were submitted to the treatments. The pastes were applied using microbrush for 3 min, and the excess was removed with a cotton swab. Between the erosive and abrasive challenges, the specimens were remineralized by artificial saliva (pH 6.8). Enamel loss was measured profilometrically (µm) after 5th day. The date were statistically analyzed by ANOVA and Tukey's test ($p<0.05$). All treated groups (placebo paste: 2.73±0.67, Nanop paste: 1.84±0.51, Nanop paste plus: 2.60±0.41, F paste: 2.87±0.65, MI paste: 2.28±0.49 and MI paste plus: 2.37±0.27) significantly differed from control (3.91±0.81). However, Nanop paste was the only treatment that significantly differed from placebo. The results suggest that Nanop paste has potential to reduce enamel erosion-abrasion, but its effect is not improved by the presence of F. Financial support: FAPESP 2009/08748-9.

Corresponding author: Cristiane de Almeida Baldini Cardoso. Al. Octávio Pinheiro Brisolla, 9-75. Bauru-SP, Brazil, 17012-901. Tel: +55-14-3235-8346 - Fax: +55-14-3227-1486 - E-mail: crisbaldini@usp.br

In vitro evaluation of microleakage of restorative materials submitted to erosive challenges

L.V.O. Diniz[1], T.M. Araújo[1], V.L. Brasileiro Júnior[1], C.H.M. Costa[1], F.D.S. Forte[1], A.F.B. Oliveira[2]

1- Department of Clinical and Social Dentistry, Federal University of Paraíba, Brazil. 2- Departament of Morphology, School of Dentistry, Federal University of Paraíba, Brazil.

The aim of this study was to evaluate the effect of erosive challenges on microleakage of class V cavities restored with different materials. Cylindrical samples from forty human molars (diameter=1.5 mm and thickness=1.5 mm) were randomly divided into four groups: group I (TPH), group II (Durafill), group III (Filtek Supreme XT) and group IV (Vitremer). Each group had its control teeth (n=5) immersed only in artificial saliva. The experimental teeth (n=5) of each group were submitted to pH cycling for erosion simulation in Coca-Cola®, under agitation, for 5min, twice daily, during 7 days. During the remaining time, the teeth were stored in artificial saliva. After cycling period, the teeth were immersed in dye and then sectioned for qualitative (scores) and quantitative (linear and area) assessments of microleakage. The quantitative (linear) and qualitative (scores 0-3) evaluations were accomplished of agreement between the tooth images and analyzed by the AnalySIS program. The data were statistically analyzed by Mann-Whitney U test ($p<0.05$). Regarding the effect of the medium, only for Durafill had a significant increase in microleakage for the specimens immersed in cola drink (0.91±0.89) compared to saliva (0.04±0.89) to the linear measures ($p=0.016$). Among the groups, there was significant difference only between Filtek (0.07±0.091) and Durafill (0.91±0.89) ($p=0.03$) for Coca-Cola® related to quantitative measures. The qualitative measures showed that saliva groups presented only scores 0 and 1 for microleakage among the different materials. Between the Coca-Cola® groups, the Durafill was the only one with score 3 and the TPH and Durafill with the score 2. The most teeth restored with Vitremer presented score 1 for Coca-Cola®. The results suggest that Durafill is the most susceptible restorative material to the effects of cola drink on microleakage. Among the materials, Filtek presented the smallest microleakage for all conditions in this *in vitro* study.

Corresponding author: Luciana Vilar de Oliveira Diniz. Al. Adalgisa Luna de Menezes, 681-402B. João Pessoa-PB, Brazil, 58051-840. Tel: +31-83-9134-6759 - E-mail: lucianavilar114@hotmail.com