

## Gingivitis

## ABSTRACTS

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- Hattori M., 1990. Effect of tea polyphenols on glucan synthesis by glucosyltransferase from *Streptococcus mutans*.
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**Study of antimicrobial activity of chamomile oil.**

Aggag, M.E., Yousef, RT.

Planta Med. 1972 Sep; 22(2): 140-4.

No abstract available.

### **The relationship of sanguinaria extract concentration and zinc ion to plaque and gingivitis.**

ANON/ Southard GL, Parsons LG, Thomas LG Jr, Boulware RT, Woodall IR, Jones BJ.

J Clin Periodontol 1987 Jul;14(6):315-9

The effects of sanguinaria extract and zinc chloride on plaque growth and gingivitis inhibition were assessed on subjects with initially plaque-free tooth surfaces using a series of oral rinses in a single-blind, crossover, no-oral-hygiene study lasting 2 weeks. A placebo oral rinse containing no sanguinaria or zinc chloride (A), and test rinses containing 150 micrograms/ml sanguinaria and 0.2% zinc chloride (B), 300 micrograms/ml sanguinaria and no zinc chloride (C), and 300 micrograms/ml sanguinaria and 0.2% zinc chloride (D) were evaluated. Subjects using the higher concentration rinses C and D had significantly lower plaque scores than rinse A at 7 and 14 days ( $p$  less than 0.05 for C,  $p$  less than 0.01 for D). However, groups C and D were not significantly different from each other. Group D had significantly lower plaque ( $p$  less than 0.05) and gingivitis ( $p$  less than 0.01) scores than group B. Subjects who used rinse B and placebo rinse A had the highest plaque and gingivitis scores and comparison of these two groups revealed no significant difference. At the end of 14 days, the % distribution of 0 plaque and gingivitis scores was greatest among subjects using rinses C and D. Subjects in these 2 groups also had the lowest incidence of plaque and gingivitis scores of 2+. It is concluded that the effects of sanguinaria rinses on developing plaque and gingivitis are influenced more by sanguinaria concentrations than the presence or absence of zinc ion, but that zinc ion may provide a mild enhancement of sanguinaria effectiveness against gingivitis.

### **Phytochemical evidence for the plant origin of Brazilian propolis from Sao Paulo state.**

Bankova V, Boudourova-Krasteva G, Sforcin JM, Frete X, Kujumgiev A, Maimoni-Rodella R, Popov S. Institute of Organic Chemistry, Bulgarian Academy of Sciences, Sofia, Bulgaria. IOCHNP@BGCICT.ACAD.BG

Z Naturforsch [C] 1999 May;54(5-6):401-405

Propolis and plant secretions from three species, most frequently mentioned as botanical sources of the bee glue in Brazil (*Baccharis dracunculifolia*, *Araucaria angustifolia* and *Eucalyptus citriodora*) have been investigated using GC-MS. Based on chemical evidence, *B. dracunculifolia* was shown to be the main propolis source in Sao Paulo state. The antibacterial and antifungal activities of all four materials were also tested, the most active being propolis and *Baccharis* leaf exudate.

### **Influence of Aloe vera on collagen characteristics in healing dermal wounds in rats.**

Chithra P, Sajithlal GB, Chandrakasan G. Department of Biochemistry, Central Leather Research Institute, Adyar, Madras, India.

Mol Cell Biochem 1998 Apr;181(1-2):71-76

Wound healing is a fundamental response to tissue injury that results in restoration of tissue integrity. This end is achieved mainly by the synthesis of the connective tissue matrix. Collagen is the major protein of the extracellular matrix, and is the component which ultimately contributes to wound strength. In this work, we report the influence of Aloe vera on the collagen content and its characteristics in a healing wound. It was observed that Aloe vera increased the collagen content of the granulation tissue as well as its degree of crosslinking as seen by increased aldehyde content and decreased acid solubility. The type I/type III collagen ratio of treated groups were lower than that of the untreated controls, indicating enhanced levels of type III collagen. Wounds were treated either by topical application or oral administration of Aloe vera to rats and both treatments were found to result in similar effects.

### **Influence of Aloe vera on collagen turnover in healing of dermal wounds in rats.**

Chithra P, Sajithlal GB, Chandrakasan G. Department of Biochemistry, Central Leather Research Institute, Adyar, Chennai, India.

Indian J Exp Biol 1998 Sep;36(9):896-901

Treatment of full-thickness wounds with *A. vera*, on rats resulted in increased biosynthesis of collagen and its degradation. A corresponding increase in the urinary excretion of hydroxyproline was also observed. Elevated levels of lysyl oxidase also indicated increased crosslinking of newly synthesised collagen. The results suggest that *A. vera* influences the wound healing process by enhancing collagen turnover in the wound tissue.

#### **Local anaesthetic, antibacterial and antifungal properties of sesquiterpenes from myrrh.**

Dolara P, Corte B, Ghelardini C, Pugliese AM, Cerbai E, Menichetti S, Lo Nostro A.

Planta Med 2000 May;66(4):356-358

We extracted, purified and characterized 8 sesquiterpene fractions from *Commyphora molmol*. In particular, we focused our attention on a mixture of furanodiene-6-one and methoxyfuranoguaia-9-ene-8-one, which showed antibacterial and antifungal activity against standard pathogenic strains of *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Candida albicans*, with minimum inhibitory concentrations ranging from 0.18 to 2.8 micrograms/ml. These compounds also had local anaesthetic activity, blocking the inward sodium current of excitable mammalian membranes.

#### **Bioenergetics in clinical medicine. IX. Gingival and leucocytic deficiencies of coenzyme Q10 in patients with periodontal disease.**

Hansen IL, Iwamoto Y, Kishi T, Folkers K, Thompson LE.

Res Commun Chem Pathol Pharmacol 1976 Aug;14(4):729-738

The specific activities of the succinate dehydrogenase-coenzyme Q10 reductase in mitochondria were determined for patients from a normal periodontal practice. The criteria for selection were patients having a bone score of 1.0-4.0 and a pocket depth of 2.5-5.2 mm. All 29 patients showed a deficiency of 20-63% of CoQ10-enzyme activity in gingival biopsies. The mean value was elevated (P less than 0.001) over that of controls. For corresponding blood samples, 24/28 (86%) showed deficiencies of 20-66% and a higher (P less than 0.001) mean value than that of controls. Periodontal patients frequently have significant gingival and leucocytic deficiencies of CoQ10. The leucocytic deficiency indicates a systemic nutritional imbalance and is not likely caused by neglected oral hygiene. A gingival deficiency could predispose this tissue to periodontitis and this disease could even augment the deficiency. These results support previously suggested adjunctive use of CoQ10 with oral hygiene for improved treatment presumably through bioenergetics.

#### **Effect of tea polyphenols on glucan synthesis by glucosyltransferase from *Streptococcus mutans*.**

Hattori M; Kusumoto IT; Namba T; Ishigami T; Hara Y Research Institute for Wakan-Yaku, Toyama Medical and Pharmaceutical University, Japan.

Chem Pharm Bull (Tokyo) (Japan) Mar 1990, 38 (3) p717-20

In the course of our studies on the development of anti-plaque agents for prevention of dental caries, we investigated effects of some of tea preparations and their individual components on the glucan synthesis catalyzed by glucosyltransferase (GTF) from *Streptococcus mutans*. Extracts of green tea and black tea, and polyphenol mixtures showed appreciable inhibition in the synthesis of insoluble glucan. Among the components isolated from tea infusions, theaflavin and its mono- and digallates had potent inhibitory activities at concentrations of 1-10 mM against GTF. (+)-Catechin, (-)-epicatechin and their enantiomers had moderate inhibitory activities at these concentrations, while galloyl esters of (-)-epicatechin, (-)-epigallocatechin and (-)-gallocatechin had increased inhibitory activities.

#### **Effectiveness of the Sonicare sonic toothbrush on reduction of plaque, gingivitis, probing pocket depth and subgingival bacteria in adolescent orthodontic patients.**

Ho HP, Niederman R Department of Orthodontics, Harvard School of Dental Medicine, Boston, MA, USA.

J Clin Dent 1997;8(1 Spec No):15-9

The Sonicare sonic toothbrush and a traditional manual toothbrush were compared for efficacy in improving periodontal health in young orthodontic patients with existing gingival inflammation. A 4-week, single-blind clinical trial was employed. Twenty-four subjects, ages 11-17 years, who were fully bonded and banded with fixed orthodontic appliances were selected. Subjects were randomly assigned to use either the manual or the Sonicare toothbrush, instructed in its use, and asked to brush each morning and

evening for 2 minutes. Plaque index, gingival index, percentage of sites which bled on probing, pocket depth, and total gram-negative bacteria in a subgingival plaque sample were assessed at baseline and 4 weeks around the banded teeth. The results demonstrate that the Sonicare brush was significantly more effective than the manual brush in all clinical parameters. Sonicare was statistically superior to the manual brush in supragingival plaque reduction (57% vs. 10%, respectively;  $p < 0.001$ ). Gingival Index scores fell by 29 percent in the Sonicare group, but only 3 percent in the manual group. Reduction of bleeding on probing was significantly greater in the Sonicare group than in the manual group ( $p < 0.001$ ). The Sonicare group decreased from 78% bleeding sites at baseline to 24.5% after 1 month. In the manual group there was only a slight reduction in bleeding on probing (70% of sites at baseline and 64.6% sites after 1 month). Mean pocket depths were significantly reduced compared to baseline values in both the Sonicare and the manual groups ( $p < 0.001$ ). Pocket depth reduction in the Sonicare group was, however, significantly greater than in the manual group (28% vs. 6%, respectively;  $p < 0.001$ ). Total gram-negative bacteria in subgingival plaque samples from banded test teeth of a subset of patients were reduced in the Sonicare group ( $p < \text{or} = 0.05$ ), but increased in the manual group. These results clearly demonstrate that the Sonicare sonic toothbrush is superior to a manual toothbrush in improving periodontal health in adolescent orthodontic patients with existing gingivitis.

#### **A pilot study of Japanese green tea as a medicament: antibacterial and bactericidal effects.**

Horiba N; Maekawa Y; Ito M; Matsumoto T; Nakamura H Department of Endodontics, School of Dentistry, Aichi-Gakuin University, Nagoya, Japan.

J Endod (United States) Mar 1991, 17 (3) p122-4

Antibacterial and bactericidal actions of extracts of four kinds of Japanese green tea were tested against 24 bacterial strains isolated from infected root canals. The extracts of all four teas had antibacterial and bactericidal actions against many of the bacteria.

#### **Nutritional composition and vitamin C stability in stored camu-camu (*Myrciaria dubia*) pulp.**

Justi KC, Visentainer JV, Evelazio de Souza N, Matsushita M. Department of Chemistry, State University of Maring, Maringa, Parana, Brazi.

Arch Latinoam Nutr 2000 Dec;50(4):405-408

Camu-camu (*Myrciaria dubia*), a native fruit of the Amazon region, is one of the richest sources of vitamin C (2.4 to 3.0 g/100 g in the pulp) found in Brazil. The purpose of this work was the physical-chemical characterization of some nutrients and the valuation of vitamin C stability in stored camu-camu pulp, produced by the Agronomic Institute of Parana (IAPAR), Parana State, Brazil. The vitamin C determination was made by titration with potassium iodate. The fruit produced in Parana State, presented a lower content of vitamin C than the one native of the amazon region, possibly due to the different development conditions of the plant, and consequently of the fruit, as well as the climatic variation, the humidity and the characteristics of the soil. Regarding the vitamin C stability in stored (-18 degrees C) camu-camu pulp, a considerable decrease in its concentration until the 28th day was observed lost 23% (from 1.57 to 1.21 g/100 g), staying approximately the same until the end of the experiment. After 335 days of storage, the content found was of approximately 1.16 g/100 g of pulp, the ascorbic acid losses amounted to 26%. This content was still higher than the one found for most fruits that are good sources of this vitamin.

#### **Mechanisms involved in the antiinflammatory effect of propolis extract.**

Khayyal MT; el-Ghazaly MA; el-Khatib AS Department of Pharmacology, Faculty of Pharmacy, Cairo University, Egypt.

Drugs Exp Clin Res (Switzerland) 1993, 19 (5) p197-203

Propolis is a natural product produced by the honey bee. The extract contains amino acids, flavanoids, terpenes and cinnamic acid derivatives. In various in vitro models propolis extract was shown to inhibit platelet aggregation and to inhibit eicosanoid synthesis, suggesting that it might have potent antiinflammatory properties. A 13% aqueous extract was tested orally in three dose levels (1, 5 and 10 ml/kg) on the carrageenan rat paw oedema model and on adjuvant-induced arthritis in rats. In both models, the extract showed potent dose-related antiinflammatory activity, which compared well with that of diclofenac (as a reference standard). The extract was then tested on an isolated sensitized guinea pig lung preparation to study its effect on the release of prostaglandins, leukotrienes and histamine. It is concluded that propolis extract has potent antiinflammatory properties in vivo. Its activity can be well correlated with its effects on the release of various mediators of inflammation .

#### **[Effect of vitamins A, E and K on the indices of the glutathione antiperoxide system in gingival tissues in periodontosis]**

Khmelevskii IuV; Danilevskii NF; Borisenko AV; Poberezkina NV

Glutathione reductase is activated and the content of glutathione sulfhydryl groups is increased in the gingival tissue of patients afflicted with parodontosis. The degree of alterations depends on the degree of the development and character of the disease. Application of antioxidant vitamin therapy (vitamins A, E and K) locally and per os normalizes the parameters under study and improves the status of the parodontium.

**[Antimicrobial effects of tea tree oil (*Melaleuca alternifolia*) on oral microorganisms].** [Article in German]

Kulik E, Lenkeit K, Meyer J. Institut für Präventivzahnmedizin und Orale Mikrobiologie, Zentrum für Zahnmedizin der Universität Basel, Hebelstrasse 3, 4056 Basel Eva.Kulik@unibas.ch

Schweiz Monatsschr Zahnmed 2000;110(11):125-130

The essential oil of *Melaleuca alternifolia* (tea tree oil) exhibits antimicrobial activity against a wide range of Gram-positive and Gram-negative bacteria, yeasts and fungi. In this study the bacteriostatic and bacteriocidal/fungicidal activity of a tea tree oil solution, of a new tea tree oil (Tebodont) and the respective placebo-gel, of a chlorhexidindigluconate-solution and of PlakOut was tested in vitro against ten different oral microorganisms. Minimum inhibitory concentrations were in the range from 0.0293% to 1.25% for the tea tree oil solution and from 0.0082% to 1.25% for the tea tree oil gel. The values for minimum bacteriocidal/fungicidal concentrations were in the range from 0.0521% to 2.5% for the tea tree oil solution and from <0.0098% to 3.33% for the tea tree oil gel. The most susceptible microorganisms were *Actinobacillus actinomycetemcomitans*, *Fusobacterium nucleatum*, and *Porphyromonas gingivalis*, whereas *Streptococcus mutans* and *Prevotella intermedia* were the least susceptible ones. Both for the chlorhexidindigluconate solution and for PlakOut the values for the minimal inhibitory concentration and for the minimal cidal concentration were between <0.0002% and 0.0125%.

**The effect of propolis and its components on eicosanoid production during the inflammatory response.**

Mirzoeva OK, Calder PC. Department of Biochemistry, University of Oxford, UK.

Prostaglandins Leukot Essent Fatty Acids 1996 Dec;55(6):441-449

To investigate the possible mechanism of the therapeutic action of propolis, we studied: (a) the effect of propolis, its components, caffeic acid phenethyl ester (CAPE), caffeic acid (CA), quercetin and naringenin, as well as the synthetic compounds indomethacin (IM) and nordihydroguaiaretic acid (NDGA), and a novel lipooxygenase inhibitor N,N'-dicyclohexyl-O-(3,4-dihydroxycinnamoyl) isourea (DCHCU) on eicosanoid production by mouse peritoneal macrophages in vitro; (b) the effect of IM, NDGA, CA, CAPE, DCHCU and propolis on eicosanoid production during acute inflammation in vivo; and (c) the ex vivo and in vivo effect of dietary propolis on arachidonic acid metabolism. The ethanol extract of propolis suppressed prostaglandin and leukotriene generation by murine peritoneal macrophages in vitro and during zymosan-induced acute peritoneal inflammation in vivo. Dietary propolis significantly suppressed the lipooxygenase pathway of arachidonic acid metabolism during inflammation in vivo. CAPE was the most potent modulator of the arachidonic acid cascade among the propolis components examined.

**Study of CoQ10-enzymes in gingiva from patients with periodontal disease and evidence for a deficiency of coenzyme Q10.**

Nakamura R, Littarru GP, Folkers K, Wilkinson EG.

Proc Natl Acad Sci U S A 1974 Apr;71(4):1456-1460

NO ABSTRACT AVAILABLE

**Calcium and the risk for periodontal disease.**

Nishida M, Grossi SG, Dunford RG, Ho AW, Trevisan M, Genco RJ. Sunstar, Inc., Osaka, Japan. SUN01574@nifty.com

J Periodontol 2000 Jul;71(7):1057-66

**BACKGROUND:** Dietary calcium has long been a candidate to modulate periodontal disease. Animal as well as human studies of calcium intake, bone mineral density, and tooth loss provide a rationale for hypothesizing that low dietary intake of calcium is a risk factor for periodontal disease. **METHODS:** We evaluated the role of dietary calcium intake as a contributing risk factor for periodontal disease utilizing the Third National Health and Nutrition Examination Survey (NHANES III), which is representative of the

U.S. civilian non-institutionalized population. Serum calcium intake was determined from a 24-hour dietary recall. The U.S. Department of Agriculture Nutrient Database was used as a source of nutrient composition data. Periodontal disease was measured by attachment loss. In addition, serum calcium was assessed using venous blood samples. Logistic regression analysis was used to examine the association between periodontal disease and dietary calcium intake or serum calcium levels after adjusting for covariants including age, gender, tobacco consumption, and gingival bleeding. RESULTS: The association of lower dietary calcium intake with periodontal disease was found for young males and females (20 to 39 years of age), and for older males (40 to 59 years of age). The relationship between low dietary calcium intake and increased levels of periodontal disease showed an estimated odds ratio (OR) of 1.84 (95% CI: 1.36 to 2.48) for young males, 1.99 (95% CI: 1.34 to 2.97) for young females, and 1.90 (95% CI: 1.41 to 2.55) for the older group of males. These odds ratios were adjusted for gingival bleeding and tobacco consumption. The dose response was also seen in females, where there was 54% greater risk of periodontal disease for the lowest level of dietary calcium intake (2 to 499 mg) and 27% greater risk in females who took moderate levels of dietary calcium (500 to 799 mg) as compared to those who took 800 mg or more dietary calcium per day. A statistically significant association between low total serum calcium and periodontal disease was found in younger females aged 20 to 39 with OR = 6.11 (95% CI: 2.36 to 15.84) but not for males or older females, after adjusting for tobacco use, gingival bleeding, and dietary calcium intake. CONCLUSIONS: These results suggest that low dietary intake of calcium results in more severe periodontal disease. Further studies will be needed to better define the role of calcium in periodontal disease and to determine the extent to which calcium supplementation will modulate periodontal disease and tooth loss.

### **A gender perspective of self-perceived oral health in adolescents: associations with attitudes and behaviours.**

Ostberg AL, Halling A, Lindblad U. Public Dental Services and Skaraborg Institute, Skovde, Sweden.

Community Dent Health 2001 Jun;18(2):110-116

**OBJECTIVE:** To investigate the associations between dental attitudes and behaviours, and self-perceived oral health from a gender perspective in an adolescent population. **DESIGN:** A census survey. Self-reported questionnaires were answered anonymously in a standardized manner in classrooms. Attitudes studied included the importance of sound teeth and feelings towards visits to the dentist. Behaviours were represented by floss usage and sweets consumption. **SETTING:** All senior and upper secondary level schools in Skaraborg County, Sweden. **SUBJECTS:** 17,280 students, aged 13-18 years. **OUTCOME MEASURES:** Self-perceived oral health, represented by a single-item rating; satisfaction with the appearance of the teeth; self-assessed gum bleeding; and a perceived oral health (POH) index. **RESULTS:** Recognising sound teeth as important was a predominating attitude among the respondents (boys 94%, girls 97%) and was significantly associated with a good perceived oral health overall. Individuals who experienced visits to dentist as unpleasant (boys 36%, girls 43%) were less likely to perceive good oral health as single-item rated (OR for boys 0.55[0.49, 0.63], girls 0.40[0.34, 0.47]). Regular use of floss had a small protective effect on bleeding gums. Daily sweets consumption showed a significant and inverse association with self-perceived oral health as single-item rated (OR for boys 0.53[0.44, 0.66], girls 0.49[0.40, 0.60]). Girls, more often than boys, perceived their oral health to be good, except in the perception of the appearance of their teeth. **CONCLUSIONS:** It is concluded that the strong associations between attitudes and self-perceived oral health should be recognised in strategies for oral health promotion and that gender differences must be considered.

### **Anticaries effects of polyphenolic compounds from Japanese green tea.**

Otake S; Makimura M; Kuroki T; Nishihara Y; Hirasawa M Department of Clinical Pathology, Nihon University School of Dentistry, Matsudo, Japan.

Caries Res (Switzerland) 1991, 25 (6) p438-43

The dental caries inhibiting effect of the extract from Japanese green tea, one of the most popular drinks in Japan, was studied both in vitro and in vivo. The crude tea polyphenolic compounds (designated Sunphenon) from the leaf of *Camellia sinensis* were found to effectively inhibit the attachment of *Streptococcus mutans* strain JC-2 (serotype c) to saliva-coated hydroxyapatite discs. Sunphenon was also inhibitory to water-insoluble glucan formation from sucrose by crude glucosyltransferase of *S. mutans* JC-2 (c). Among the tea catechins tested, (-)-epigallocatechin gallate and (-)-epicatechin gallate showed the most potent inhibition of the glucosyltransferase activity. Finally, significantly lower caries scores were observed in specific pathogen free rats infected with *S. mutans* JC-2 (c) and fed a cariogenic diet and/or drinking water containing 0.05% Sunphenon as compared with control rats not receiving polyphenolic compounds.

### **Folate mouthwash: effects on established gingivitis in periodontal patients.**

Pack AR

J Clin Periodontol 1984 Oct;11(9):619-28

A double blind study was designed to determine the effects of folate mouthwash (MW) on established gingivitis in non-pregnant

adults. 60 subjects who had greater than 20 teeth, visible gingival inflammation around greater than 6 teeth, no complicated medical history, currently not receiving periodontal treatment or medication, and not wearing dentures, were randomly assigned to control or experimental groups. Full mouth assessment included plaque scores, gingival colour changes, bleeding tendency around every tooth and experience of disease and local factors. Subjects used 5 ml of MW twice daily for 4 weeks, rinsing for 1 min before expectorating. Experimental MW contained 5 mg folate per 5 ml. The control group used a placebo MW. A detailed 3-day diet record was kept by each subject. The oral examination was repeated after 4 weeks. Initially, groups were similar except that the experimental group exhibited more bleeding sites at the outset, but after 4 weeks, the experimental group showed a significant decrease in mean number of colour change sites (from 70.17 +/- 12.89 to 56.62 +/- 17.42) and in bleeding sites (from 48.59 +/- 24.28 to 29.28 +/- 19.64) compared with control group (colour: from 66.93 +/- 15.27 to 66.20 +/- 18.83; bleeding: from 36.93 +/- 16.96 to 39.47 +/- 16.67) p less than 0.001. Dietary analysis showed that few subjects ate greater than 200 micrograms folate daily. However, the level of dietary folate did not correlate with changes in inflammation in experimental subjects,  $r = 0.097$ . Folate MW appears to have an influence on gingival health through local rather than systemic influence.

### **Antibacterial activity of *Camellia sinensis* extracts against dental caries**

Rasheed A; Haider M Faculty of Pharmacy, University of the Punjab, Lahore, Pakistan.

Arch Pharm Res (Korea) Jun 1998, 21 (3) p348-52

Different bacteria were separated from saliva and teeth of cariogenic patients and identified by a variety of morphological and biochemical tests. Extracts of green tea strongly inhibited *Escherichia coli*, *Streptococcus salivarius* and *Streptococcus mutans*. The antibacterial effect of green and black tea extracts were compared with those of amoxicillin, cephadrine and eugenol.

### **Increased production of antigen-specific immunoglobulins G and M following in vivo treatment with the medicinal plants *Echinacea angustifolia* and *Hydrastis canadensis*.**

Rehman J, Dillow JM, Carter SM, Chou J, Le B, Maisel AS. Department of Internal Medicine, Veterans Affairs Medical Center and University of California, San Diego 92161, USA.

Immunol Lett 1999 Jun 1;68(2-3):391-395

A number of immunomodulatory effects have been attributed to the medicinal plants *Echinacea angustifolia* and Goldenseal (*Hydrastis canadensis*); however, little is known about whether treatment with these plants can enhance antigen-specific immunity. We investigated the antigen-specific in vivo immunomodulatory potential of continuous treatment with *Echinacea* and Goldenseal root extract over a period of 6 weeks using rats that were injected with the novel antigen keyhole limpet hemocyanin (KLH) and re-exposed to KLH after the initial exposure. Immunoglobulin production was monitored via ELISA continuously over a period of 6 weeks. The *Echinacea*-treated group showed a significant augmentation of their primary and secondary IgG response to the antigen, whereas the Goldenseal-treated group showed an increase in the primary IgM response during the first 2 weeks of treatment. Our results suggest that medicinal plants like *Echinacea* or Goldenseal may enhance immune function by increasing antigen-specific immunoglobulin production.

### **The inhibitory effect of funoran and eucalyptus extract-containing chewing gum on plaque formation.**

Sato S; Yoshinuma N; Ito K; Tokumoto T; Takiguchi T; Suzuki Y; Murai S Department of Periodontology, Nihon University School of Dentistry, Tokyo, Japan.

J Oral Sci (Japan) Sep 1998, 40 (3) p115-7

The purpose of this study was to evaluate the inhibitory effect of funoran containing chewing gum (FG) and eucalyptus extract-containing chewing gum (EG) on plaque formation. Fifteen dentists or dental students were assigned a random order of use of either FG, EG or a control gum. All subjects received professional tooth cleanings before the experiment. During the four-day test periods, no oral hygiene measures were allowed other than chewing three pieces of gum for approximately 10 min daily. Chewing gum was used following each morning, noon and evening meal. Plaque formation was evaluated by the Quigley and Hein index. The FG (1.83 +/- 1.1) and EG (1.97 +/- 1.1) significantly reduced plaque compared to the control gum (2.57 +/- 1.2). Our results suggest that FG and EG may be useful in inhibiting dental plaque formation.

### **The Coenzyme Q10 Phenomenon 1998.**

Sinatra, S.T.

Chicago: Keats. Chapter 8.

## **Oral changes in a folic acid deficient patient precipitated by anticonvulsant drug therapy**

Stein GM; Lewis H Westmoreland Hosp., Greensburg, Pa., United States

Journal of Periodontology, 1973, 44/- (645-650)

A case history is presented of a 17 yr old female with a history of epilepsy from the age of 12 yr, who was receiving 250 mg of primidone 4 times daily, and who reported to hospital complaining of a sore mouth. On examination there were pallor of the mucous membranes, and ulcerations of the lips, tongue, and alveolar and buccal mucosa. Ballooning of the alveolar mucosa was seen and there was generalized gingivitis and a glossitis which extended from the tip of the tongue to the posterior tonsillar wall. She was apathetic and the hematocrit showed a 15% reduction. On the 4th day in hospital she was started on sodium folate, 15 mg daily. The hematocrit gradually increased and the oral ulcerations improved. She was discharged on folate and phenobarbital therapy. 6 wk later she was in excellent health and free from convulsions. No oral disease was present. This report should alert the clinician to the possibility that an anticonvulsant drug can induce folic acid deficiency with accompanying oral epithelial changes.

## **Effects of extended systemic and topical folate supplementation on gingivitis of pregnancy.**

Thomson ME, Pack AR J Clin Periodontol 1982 May;9(3):275-80

A former double-blind study evaluated the effect of a 14-day period of systemic and topical folate supplementation on gingival inflammation during pregnancy (Pack & Thomson 1980). The current experiment was similar to the earlier one except that supplementation was for 28 days during the eighth month only. Thirty women during their 32nd week of pregnancy were randomly divided into three equal groups. Control Group A received placebo mouthwash (MW) and placebo tablets; Group B received placebo MW and one 5 mg folate tablet daily; Group C received placebo tablets and rinsed with folate MW twice daily for 1 min. At the beginning and end of the experimental period, oral status was determined using a plaque index (PII) and a gingival index (GI). Each subject furnished a 1-week diet record which was analysed for dietary folate. No differences in parameters existed between groups at the commencement of the study except for folate levels which were lower in Group B. Results confirmed the findings of the former experiment. Group C showed highly significant improvement in GI despite no significant changes in PII (0.001 less than P less than 0.01), whilst in Group B, changes in gingival health were not statistically significant (0.05 less than P less than 0.10). No significant changes were demonstrated in Group A. Folate levels increased significantly in Groups B and C. Dietary folate was similar in all groups.

## **Simultaneous determination of catechins in human saliva by high-performance liquid chromatography.**

Tsuchiya H; Sato M; Kato H; Okubo T; Juneja LR; Kim M Department of Dental Pharmacology, Asahi University School of Dentistry, Gifu, Japan.

J Chromatogr B Biomed Sci Appl (Netherlands) Dec 5 1997;703(1-2)p253-8

Green tea extracts have been suggested to possess a preventive effect against dental caries. A quantitative method for their anticariogenic substances, catechins, was developed to evaluate their concentrations in human saliva after mouthrinsing with green tea extract. Salivary catechins were extracted to the organic phase after forming a complex with diphenyl-borate and an ion-pair with tetra-n-butylammonium, and then back-extracted to the acidic aqueous phase. The extract was analyzed by high-performance liquid chromatography using diode array detection at absorption wavelengths ranging from 269 to 278 nm. In reversed-phase chromatography by a gradient elution, eight catechins originating from green tea and an internal standard were separated in 15 min without interfering peaks. All the catechins were simultaneously and selectively determined in the concentration range 0.05-25.0 microg/ml. In replicate spiking experiments with standards, the mean recovery ranged between 86 and 99%, and both intra- and inter-assay C.V.s were within 2.3%. When mouthrinsing with an aqueous solution of green tea extract (5.0 mg/ml) containing eight catechins, the quantitative results revealed that each catechin was retained at microg/ml levels in saliva for up to 60 min.

## **Antiinflammatory activity of extracts from Aloe vera gel.**

Vazquez B, Avila G, Segura D, Escalante B. Laboratory of Pharmacology, Escuela Nacional de Estudios Profesionales Iztacala (E.N.E.P-I), Universidad Nacional Autonoma de Mexico, Tlalnepantla, Mexico.

J Ethnopharmacol 1996 Dec;55(1):69-75

We studied the effects of aqueous, chloroform, and ethanol extracts of Aloe vera gel on carrageenan-induced edema in the rat paw, and neutrophil migration into the peritoneal cavity stimulated by carrageenan. We also studied the capacity of the aqueous extract to inhibit cyclooxygenase activity. The aqueous and chloroform extracts decreased the edema induced in the hind-paw and the

number of neutrophils migrating into the peritoneal cavity, whereas the ethanol extract only decreased the number of neutrophils. The antiinflammatory agents indomethacin and dexamethasone also decreased carrageenan-induced edema and neutrophil migration. The aqueous extract inhibited prostaglandin E2 production from [<sup>14</sup>C]arachidonic acid. The chemical tests performed in the aqueous extract for anthraglycosides, reductor sugars and cardiotoxic glycosides were positive. In the ethanol extract, the chemical tests performed for saponins, carbohydrates, naphthoquinones, sterols, triterpenoids and anthraquinones were also positive. In the chloroform extract, the chemical tests performed for sterols type delta 5, and anthraquinones were positive. These results demonstrated that the extracts of Aloe vera gel have antiinflammatory activity and suggested its inhibitory action on the arachidonic acid pathway via cyclooxygenase.

**[Physico-chemical characterization of acerola (*Malpighia glabra* L.) produced in Maringa, Parana State, Brazil].** [Article in Portuguese]

Visentainer JV, Vieira OA, Matsushita M, de Souza NE. Departamento de Quimica, Universidade Estadual de Maringa, Parana, Brasil.

Arch Latinoam Nutr 1997 Mar;47(1):70-72

The acerola *Malpighia glabra* L., originally from the Antillas and North of South America, known by the people as cereja-das-antilhas or cereja-do-para distinguish itself by its high content of vitamin C. The ripe and fresh acerola fruits utilized in experiments, were obtained from farmers of Maringa region, Parana State, Brazil. The fruits were hulled in steel sieve with 25 mesh and the bagasse (seeds and hull) discarded. These physico-chemical analysis were realized in the pulp: vitamin C, moisture, protein, carbohydrate, fiber, lipids and fatty acids composition. We also determined the content of ash and cadmium, calcium, lead, copper, chrome, iron, magnesium, manganese, potassium, sodium and zinc minerals. The average content of vitamin C was 1.79 g/100 g of pulp, it was higher than the one for other fruits, like pineapple, araca, cashew, guava, kiwi, orange, lemon, and strawberry and lower than the camu-camu sylvestral fruit of Amazonia. The contents of moisture, carbohydrate, fiber, lipids and minerals in the acerola were not significantly different when compared to other fruits.

#### **The effect of folic acid on gingival health.**

Vogel RI, Fink RA, Schneider LC, Frank O, Baker H.

J Periodontol 1976 Nov;47(11):667-8

On days 0 and 30 of a double blind study, two groups of 15 subjects each were evaluated using a plaque index, a gingival index, a gingival exudate flow and fasting plasma folic acid levels. Group I received 2 mg of folic acid twice daily for 30 days while Group II received a placebo. Results of the study seem to indicate that folic acid supplemented to the diet may increase the resistance of the gingiva to local irritants and thus lead to a reduction in inflammation.

#### **The effect of folic acid on experimentally produced gingivitis.**

Vogel, R.I., Deasy, M.J.

J. Prev. Dent. 1978 Jul-Aug; 5(4): 30-2.

No abstract available.

#### **Experimental study: contraceptive users with normal plasma folate levels demonstrated improved gingival health after receiving supplementation with folic acid 4 mg/d for 60 days.**

Vogel, R.L. et al.

J. Prev. Dent. 1980; 6: 221.

No abstract available.

#### **The effect of topical application of folic acid on gingival health.**

Vogel RI, Fink RA, Frank O, Baker H.

Oral Med. 1978 Jan-Mar;33(1):22-2.

No abstract available.

**Examination of the relation between periodontal health status and cardiovascular risk factors: serum total and high density lipoprotein cholesterol, C-reactive protein, and plasma fibrinogen.**

Wu T, Trevisan M, Genco RJ, Falkner KL, Dorn JP, Sempos CT. Department of Social and Preventive Medicine, State University of New York at Buffalo, NY, USA.

Am J Epidemiol 2000 Feb 1;151(3):273-282

Using data from the Third National Health and Nutrition Examination Survey (1988-1994), the authors examined the relation between periodontal health and cardiovascular risk factors: serum total and high density lipoprotein cholesterol, C-reactive protein, and plasma fibrinogen. A total of 10,146 participants were included in the analyses of cholesterol and C-reactive protein and 4,461 in the analyses of fibrinogen. Periodontal health indicators included the gingival bleeding index, calculus index, and periodontal disease status (defined by pocket depth and attachment loss). While cholesterol and fibrinogen were analyzed as continuous variables, C-reactive protein was dichotomized into two levels. The results show a significant relation between indicators of poor periodontal status and increased C-reactive protein and fibrinogen. The association between periodontal status and total cholesterol level is much weaker. No consistent association between periodontal status and high density lipoprotein cholesterol was detectable. Similar patterns of association were observed for participants aged 17-54 years and those 55 years and older. In conclusion, this study suggests that total cholesterol, C-reactive protein, and fibrinogen are possible intermediate factors that may link periodontal disease to elevated cardiovascular risk.

**Study on feasibility of Chinese green tea polyphenols(CTP)for preventing dental caries**

You SQ Department of Stomatology, Ning bo First Hospital.

Chung Hua Kou Chiang Hsueh Tsa Chih (China) Jul 1993,28(4)p197-9,254

This study demonstrated that streptococcus mutans could be inhibited completely after contacted with 0.1% CTP for 5 minutes. There were no drug resistance after repeat cultures in 0.025% CTP. Plaque Index and Gingival Index decreased significantly ( $P < 0.001$ ) after 0.2% CTP were used to rinse and brush the teeth. Results proved that CTP is an effective agent to prevent dental caries.

**Healthy Mouth, Healthy Body 2000,**

Zeines, V.

p. 63. New York: Kensington Books.

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- 

### **Anticaries effects of polyphenolic compounds from Japanese green tea.**

Otake S; Makimura M; Kuroki T; Nishihara Y; Hirasawa M  
Department of Clinical Pathology, Nihon University School of Dentistry, Matsudo, Japan.  
Caries Res (Switzerland) 1991, 25 (6) p438-43

The dental caries inhibiting effect of the extract from Japanese green tea, one of the most popular drinks in Japan, was studied both in vitro and in vivo. The crude tea polyphenolic compounds (designated Sunphenon) from the leaf of *Camellia sinensis* were found to effectively inhibit the attachment of *Streptococcus mutans* strain JC-2 (serotype c) to saliva-coated hydroxyapatite discs. Sunphenon was also inhibitory to water-insoluble glucan formation from sucrose by crude glucosyltransferase of *S. mutans* JC-2 (c). Among the tea catechins tested, (-)-epigallocatechin gallate and (-)-epicatechin gallate showed the most potent inhibition of the glucosyltransferase activity. Finally, significantly lower caries scores were observed in specific pathogen free rats infected with *S. mutans* JC-2 (c) and fed a cariogenic diet and/or drinking water containing 0.05% Sunphenon as compared with control rats not receiving polyphenolic compounds.

### **A pilot study of Japanese green tea as a medicament: antibacterial and bactericidal effects.**

Horiba N; Maekawa Y; Ito M; Matsumoto T; Nakamura H  
Department of Endodontics, School of Dentistry, Aichi-Gakuin University, Nagoya, Japan.  
J Endod (United States) Mar 1991, 17 (3) p122-4

Antibacterial and bactericidal actions of extracts of four kinds of Japanese green tea were tested against 24 bacterial strains isolated from infected root canals. The extracts of all four teas had antibacterial and bactericidal actions against many of the bacteria.

### **Effect of tea polyphenols on glucan synthesis by glucosyltransferase from *Streptococcus mutans*.**

Hattori M; Kusumoto IT; Namba T; Ishigami T; Hara Y  
Research Institute for Wakan-Yaku, Toyama Medical and Pharmaceutical University, Japan.  
Chem Pharm Bull (Tokyo) (Japan) Mar 1990, 38 (3) p717-20

In the course of our studies on the development of anti-plaque agents for prevention of dental caries, we investigated effects of some of tea preparations and their individual components on the glucan synthesis catalyzed by glucosyltransferase (GTF) from *Streptococcus mutans*. Extracts of green tea and black tea, and polyphenol mixtures showed appreciable inhibition in the synthesis of insoluble glucan. Among the components isolated from tea infusions, theaflavin and its mono- and digallates had potent inhibitory activities at concentrations of 1-10 mM against GTF. (+)-Catechin, (-)-epicatechin and their enantiomers had moderate inhibitory activities at these concentrations, while galloyl esters of (-)-epicatechin, (-)-epigallocatechin and (-)-gallocatechin had increased inhibitory activities.

### **Triterpene alcohols from the flowers of compositae and their anti-inflammatory effects.**

Akihisa T; Yasukawa K; Oinuma H; Kasahara Y; Yamanouchi S; Takido M; Kumaki K; Tamura T  
College of Science and Technology, Nihon University, Tokyo, Japan.  
Phytochemistry (United States) Dec 1996, 43 (6) p1255-60

Eleven tabular and nine ligulate flowers from 15 species of Compositae plants were investigated for their triterpene alcohol constituents. This led to the isolation and identification of 11 triterpene alcohols as follows: heliaol, taraxasterol, psi-taraxasterol, alpha-amyrin, beta-amyrin, lupeol, taraxerol, cycloartenol, 24-methyl-encycloartanol, tirucalla-7,24-dienol and dammaradienol. The tabular flowers of *Calendula officinalis*, *Carthamus tinctorius*, *Cosmos bipinnatus*, *Chrysanthemum morifolium*, *Helianthus annuus* and *Matricaria matricarioides* showed a characteristic feature by containing helianol as the most predominant component (29-86%) in the triterpene alcohol fractions. The triterpene alcohols from Compositae flowers were evaluated with respect to their anti-inflammatory activity against 12-O-tetradecanoylphorbol-13-acetate-induced inflammation (1 microgram per ear) in mice. All of these showed marked inhibitory activity, and their 50% inhibitory dose was 0.1-0.8 mg per ear.

### **[Anti-inflammatory action of a group of plant extracts]**

Shipochliev T; Dimitrov A; Aleksandrova E  
Vet Med Nauki (Bulgaria) 1981, 18 (6) p87-94

Use was made of Wistar albino rats in which an inflammation was induced via the simultaneous injection of caraginan and prostaglandin E1 in order to evaluate the antiinflammatory activity of 6 freeze dried plant extracts. It was found that with such model of inflammation the inflammatory effect of caraginan was strongly enhanced, which was accompanied by the rapid and prolific white blood cell extravasates. The freeze-dried extracts of St. John's-wort (*Hypericum perforatum* L.), potmarigold calendula (*Calendula officinalis* L.), camomile (*Matricaria chamomilla* L.) and plantain (*Plantago lanceolata* L. et *Pl. major* L.) were found to suppress both the inflammatory effect and the leukocyte infiltration. The extracts of symphytum (*Symphytum officinale* L.) and those of flax seed (*Linum usitatissimum* L.) did not inhibit the inflammation, however, they suppressed the leukocyte infiltration at the 3rd and 4th hour of the induced inflammation .

### **Anti-calculus activity of a toothpaste with microgranules.**

Chesters RK; O'Mullane DM; Finnerty A; Huntington E; Jones PR  
Unilever Dental Research, Port Sunlight Laboratory, Wirral, Merseyside, UK.  
Oral Dis (England) Sep 1998, 4 (3) p213-6

**OBJECTIVE:** The objective of the trial was to determine the efficacy of the proven anticalculus active system (zinc citrate trihydrate [ZCT] and triclosan), when the ZCT is delivered from microgranules incorporated in a silica-based toothpaste containing 1450 ppm F as sodium fluoride.

**DESIGN:** A monadic, single-blind, two phase design clinical trial was used to compare the effect of the test and a negative control fluoridated toothpaste on the formation of supragingival calculus.

**SUBJECTS AND METHODS:** Male and female calculus-forming volunteers, aged 18 or over, were recruited for the study following a 2-week screening phase. All subjects were given a scale and polish of their eight lower anterior teeth at the start of both the pre-test and test phases. Subjects were supplied with a silica-based 1450 Fppm fluoridated toothpaste with no anti-calculus active for use during an 8-week pre-test phase. Calculus was assessed at the end of the pre-test and test phases using the Volpe-Manhold index (VMI). Subjects were stratified according to their pre-test VMI score (8-10, 10.5-12, > 12) and gender and then allocated at random to test or negative control toothpaste groups. Subjects with < 8 mm of calculus were excluded from further participation.

**MAIN OUTCOME MEASURE:** The outcome variable was the mean VMI score for the test and negative control groups.

**RESULTS:** The test toothpaste caused a statistically significant 30% reduction in calculus compared with the control paste after a 13-week use. No adverse events were reported during the study.

**CONCLUSION:** The incorporation of the ZCT in microgranules did not adversely affect the anticalculus activity of the new formulation.

### **Effect of citric acid concentration on dentin demineralization, dehydration, and rehydration: atomic force microscopy study.**

Marshall GW Jr; Wu-Magidi IC; Watanabe LG; Inai N; Balooch M; Kinney JH; Marshall SJ  
Department of Restorative Dentistry, University of California, San Francisco 94143-0758, USA.  
graymar@itsa.ucsf.edu  
J Biomed Mater Res (United States) Dec 15 1998, 42 (4) p500-7

Most current dentin bonding procedures use acid etchants to partially demineralize the dentin structure and provide pathways for resin infiltration. This study determined the recession rates of peritubular dentin and intertubular dentin as a function of pH during demineralization in citric acid solutions (0.0005-2.5M) and the effects of dehydration and rehydration on the partially demineralized dentin. Polished dentin disks were prepared with an internal reference layer and were studied at specific intervals for citric acid etching between pH 1 and 3.4 in an atomic force microscope. Peritubular dentin etched rapidly and linearly with time until it could no longer be measured. The intertubular surface began etching at nearly the same rate, but then recession slowed for all concentrations and stabilized after recession of less than 1 microm for all but the pH 1 solution. The decrease in recession was attributed to the limitation of contraction of the demineralized collagen scaffold as long as it remained hydrated. Dehydration following etching resulted in significant collapse of the surface, changes in roughness, and a slight decrease in tubule diameter for samples etched for 30 min. Measurements could not be made of the collapse for low pH samples, because shrinkage stresses disrupted the integrity of the reference layer. On rehydration, the dehydrated surfaces underwent an expansion up to the level seen after etching and tubule diameters returned to the etched values. These results indicate that the collapse of demineralized matrix is almost totally recoverable on rehydration.

### **The effectiveness of three irrigating solutions on root canal cleaning after hand and mechanical preparation.**

Liolios E; Economides N; Parissis-Messimeris S; Boutsoukias A  
Department of Dental Pathology and Therapeutics, School of Dentistry, Aristotle University of Thessaloniki, Greece.  
Int Endod J (England) Jan 1997, 30 (1) p51-7

The purpose of this in vitro study was to evaluate and compare the efficacy of three irrigating solutions after hand and mechanical

instrumentation. Sixty intact, single, straight-rooted, human teeth were used in this study. They were instrumented using K-files sizes 15 to 50 with hand or mechanical instrumentation. Mechanical instrumentation was with one of two handpieces, the Endocursor or Endolift. Instrumentation time for each file was 1 min. Each change of file was followed by irrigation with 1 mL 1% NaOCl. A flush of 2 mL of one of three irrigating solutions Largal Ultra, Tubulicid Plus or 50% citric acid, was administered at the end of the instrumentation and a final flush of 5 mL distilled water completed the treatment. The specimens were prepared and viewed under the scanning electron microscope. There were no significant differences in the smear layers produced by the three methods of instrumentation. The use of Largal Ultra and Tubulicid Plus removed considerable amounts of the smear layer regardless of the method of instrumentation. The use of 50% citric acid, on the other hand, removed the smear layer only partially whilst producing rather diverse findings.

## **Effect of citric acid clearance on the saturation with respect to hydroxyapatite in saliva.**

Bashir E; Lagerlof F

Department of Cariology, School of Dentistry, Karolinska Institutet, Huddinge, Sweden.

Caries Res (Switzerland) 1996, 30 (3) p213-7

Citric acid contained in beverages and foods is one of the main causes of enamel erosion. It was hypothesized that the clearance of citric acid from saliva would influence the degree of salivary saturation with respect to hydroxyapatite (OHAp). Ten subjects rinsed with 2% citric acid, pH 2.1, for 5s. Before and at 1,2, 5, 10 and 15 min after the rinse, a small saliva sample was collected. The sample pH, ionic strength and the concentrations of ionized calcium, inorganic phosphate and citric acid were determined. The pH of the saliva decreased from 7.21 + or - 0.40 (mean + or - SD) at time zero to a minimum of 6.46 + or - 0.88 at 1 min after the rinse. It was back to baseline value after 15 min. The saliva was supersaturated with respect to OHAp at time zero. After the rinse with the citric acid the saturation level shifted to undersaturation in all individuals except one. At 1 and 2 min after the rinse the saliva was, on average, undersaturated. After 5 min the average saturation level was back to supersaturation. The individual differences were large. The correlations between the rate of clearance of citric acid during the 1 minute and the minimum degree of saturation with respect to OHAp at 1,2 and 5 min after the rinse were significant ( $r$  0.84,  $r$  0.76 and  $r$  0.79, respectively). In conclusion, rinsing with citric acid will cause a decrease in the saturation level with respect to OHAp in a highly individual pattern.

## **Site specificity of citric acid retention after an oral rinse.**

Bashir E; Gustavsson A; Lagerlof F

Department of Cariology, School of Dentistry, Karolinska Institutet, Huddinge, Sweden.

Caries Res (Switzerland) 1995, 29 (6) p467-9

Erosion of the buccal incisor enamel, most frequent in the upper jaw, has been associated with excessive oral exposure to citric acid -containing foodstuffs. The aim of the study was to determine the retention of citric acid at different sites in the mouth after a standardized exposure. Thirty-four normal subjects rinsed with 95.2 mmol/l (2%) citric acid, pH 2.1, for 5 s. At 1 min 55 s after the rinse a preweighed cotton pellet was used to collect saliva samples from upper labial incisor surfaces (UB), lower labial incisor surfaces (LB) and sublingually (SL). The citric acid concentration was determined enzymatically. The concentrations were (mean +/- SD): 32.12 +/- 19.50, 11.90 +/- 8.60 and 1.52 +/- 1.90 mmol/l in the saliva collected from the UB, LB and SL sites, respectively. Analysis of variance revealed that the citric acid concentration in the upper incisor site differed significantly from that of the lower incisor site ( $p < 0.001$ ) and the sublingual site ( $p < 0.001$ ), and that the lower incisor site differed significantly from the sublingual site ( $p < 0.001$ ). The individuals differed significantly with respect to citric acid retention ( $p < 0.05$ ). A significant correlation was found between UB and LB sites ( $r = 0.61$ ,  $p < 0.05$ ).

## **The effect of ultrasonic irrigation before and after citric acid treatment on collagen fibril exposure: an in vitro SEM study.**

Higashi T; Okamoto H

Department of Endodontology and Periodontology, Hiroshima University School of Dentistry, Japan.

J Periodontol (United States) Oct 1995, 66 (10) p887-91

The surface characteristics of periodontally diseased human teeth after two treatments were compared both before and after partial demineralization with citric acid. Thirteen teeth were obtained from patients with advanced periodontal disease. Three teeth were selected for control groups and 10 were used for experimental groups. All diseased root surfaces were identified and outlined. The

roots were cut longitudinally into two sections. They were then scaled and root planed and the paired sections were separately classified into two control or two experimental groups. Three sections in control group 1 were rinsed by syringe with saline solution. The three sections in control group 2 were treated with ultrasonic irrigation. The 10 sections in experimental group 1 were rinsed by syringe with saline solution before and after citric acid application; the 10 sections in experimental group 2 were irrigated ultrasonically before and after citric acid application. The concentration of the citric acid was 25% (pH 1.62) and the immersion time was 3 minutes. The root samples were examined by scanning electron microscope. A significant amount of grinding debris covered on all the root surfaces in control group 1, whereas smear was removed in control group 2. The features of root surfaces of the two experimental groups differed considerably. All specimens in experimental group 2 exhibited collagen fibrils exposed as a consequence of citric acid etching. On the other hand, the smear layer was not thoroughly removed from the root surface in experimental group 1, which meant that few collagen fibrils were exposed after partial demineralization. From these results, ultrasonic irrigation before and after citric acid application improves exposure of collagen fibrils, which may be desirable for clinical success in periodontal regenerative therapy.

## **Salivary clearance of citric acid after an oral rinse.**

Bashir E; Ekberg O; Lagerlof F

Division of Cariology, Center for Clinical Oral Science, Huddinge, Sweden.

J Dent (England) Aug 1995, 23 (4) p209-12

**OBJECTIVES:** Citric acid clearance from the oral cavity may be an important factor in the erosion of dental enamel. The aim of the present study was to investigate the clearance pattern of citric acid in normal subjects.

**METHODS:** After determination of the unstimulated salivary flow rate and the residual volume of saliva after normal swallowing, 12 subjects rinsed with 95.2 mmol l<sup>-1</sup> citric acid for 5 s. At 1, 2, 5, 10 and 15 min after the rinse a small saliva sample was collected and the concentration of citric acid was determined enzymatically. For each subject three separate experiments on different occasions were performed with a citric acid solution of pH 2.1 and one experiment with a solution of pH 4.5.

**RESULTS:** The salivary citric acid concentration declined biphasically: rapidly during the first 2 min, then more slowly. The elimination rate over the first minute was on average 87.7 mmol l<sup>-1</sup> min<sup>-1</sup> at pH 2.1 compared with 85.0 mmol l<sup>-1</sup> min<sup>-1</sup> at pH 4.5. The difference between individuals estimated from the areas under the clearance curve was strongly significant ( $P < 0.001$ ). No significant relation was found neither between salivary flow rate and clearance, nor between residual volume after swallowing and clearance.

**CONCLUSION:** The clearance pattern of citric acid is an individual property.

## **Comparison between 3 triclosan dentifrices on plaque, gingivitis and salivary microflora.**

Renvert S; Birkhed D

School of Dental Hygiene, University of Kristianstad, Sweden.

J Clin Periodontol (Denmark) Jan 1995, 22 (1) p63-70

3 triclosan-containing dentifrices were compared in a 6-month, unsupervised tooth brushing study. The effects on plaque, gingival bleeding and certain salivary micro-organisms (mutans streptococci, lactobacilli, total counts of streptococci and total counts of micro-organisms) were evaluated. 123 subjects were divided into 4 groups according to severity of gingival bleeding index. 112 subjects completed the study. Following a 4-week pre-experimental period, using a sodium monofluorophosphate dentifrice (placebo), the subjects were assigned to use one of 3 triclosan-containing dentifrices, available on the Swedish market: Colgate Paradent (a triclosan/copolymer dentifrice) ( $n = 26$ ); Pepsodent Gum Health (a triclosan/zinc citrate dentifrice) ( $n = 31$ ); Dentosal Friskt Tandkott (a triclosan/pyrophosphate dentifrice) ( $n = 28$ ); or to continue with the placebo ( $n = 27$ ). The results revealed that Colgate Paradent reduced baseline plaque values by 39% (Quigley and Hein) over the 6-month experimental period. The corresponding values for the other modalities were: a reduction of 6% for Pepsodent Gum Health, an increase of 5% for Dentosal Friskt Tandkott, and an increase of 2% for placebo. A significant difference in the plaque levels ( $p < 0.05$ ) was found between Colgate Paradent and Pepsodent Gum Health and between Colgate Paradent and placebo. The gingival bleeding index was improved in all 4 groups. A significant difference ( $p < 0.05$ ) was found with respect to bleeding between Colgate Paradent and placebo ( $p < 0.05$ ) at the 3-month registration. A statistically significant increase over time in total number of streptococci and total colony forming units were found for the Dentosal, Pepsodent and placebo groups, but not for Colgate.(ABSTRACT TRUNCATED AT 250 WORDS)

## **Antimicrobial activity of Pelargonium essential oils added to a quiche filling as a model food system.**

Lis-Balchin M; Buchbauer G; Hirtenlehner T; Resch M  
School of Applied Science, South Bank University, London, UK. Lisbairnt@sbu.ac.uk  
Lett Appl Microbiol (England) Oct 1998, 27 (4) p207-10

Eight essential oils obtained by steam distillation from the scented leaves of Pelargonium species and cultivars were added at 250, 500 and 1000 ppm to a quiche filling, inoculated with either Saccharomyces ludwigii or Zygosaccharomyces bailii (at 10(8) cfu g<sup>-1</sup>), Salmonella enteritidis or Listeria innocua (at 10(9) cfu g<sup>-1</sup>). The quiche fillings were then kept at 25 degrees C for 24 h and the residual number of micro-organisms determined using the pour plate technique. There was an effective antimicrobial activity by the Pelargonium essential oils at 250 ppm, comparable with that of commercial thyme oil, an excellent antimicrobial agent, against Saccharomyces ludwigii and Zygosaccharomyces bailii, and a lesser inhibition compared with commercial thyme against Salm, enteritidis. There was a greater diversity of activity against L. innocua, which was in some cases more effective than commercial thyme oil. At 500 ppm, there was a greatly increased inhibition of microbial growth using the Pelargonium essential oils, which was comparable with that of commercial thyme, clove, geranium and coriander oils. As there is no evidence for the toxicity of any of these novel Pelargonium oils, and their odour does not make the delicately flavoured quiche filling unpalatable, there is a strong potential for their use in food processing.

## **Factors that interact with the antibacterial action of thyme essential oil and its active constituents.**

Juven BJ; Kanner J; Schved F; Weisslowicz H  
Institute of Technology and Storage of Agricultural Products, Volcani Centre, Bet Dagan, Israel.  
J Appl Bacteriol (England) Jun 1994, 76 (6) p626-31

The viable counts of Salmonella typhimurium on nutrient agar (NA) decreased upon the addition of either the essential oil of thyme or its constituent thymol, especially under anaerobic conditions. Antagonistic effects of thymol against Staphylococcus aureus were also greater under anaerobic conditions. In contrast to the phenolic constituents of the oil, thymol and carvacrol, the chemically related terpenes p-cymene and gamma-terpinene had no antagonistic effects against Salm. typhimurium. The addition of Desferal to NA counteracted the antibacterial effects of both thyme oil and thymol. No support was obtained, however, for a possible role of iron in the oxygen-related antibacterial action of the thyme oil and thymol or for the observed effect of Desferal. In the presence of thymol, the viable counts of Salm. typhimurium obtained on a minimal medium (MM) were lower than those obtained on NA. Addition of bovine serum albumin (BSA) neutralized the antibacterial action of thymol. It is suggested that the effects of BSA or Desferal are due to their ability to bind phenolic compounds through their amino and hydroxylamine groups, respectively, thus preventing complexation reactions between the oil phenolic constituents and bacterial membrane proteins. This hypothesis is supported by the marked decrease in the viable counts of Salm. typhimurium caused by either thyme oil or thymol when the pH of the medium was changed from 6.5 to 5.5 or the concentration of Tween 80 in the medium was reduced.

## **The comparative clinical efficacy of pyrophosphate/triclosan, copolymer/triclosan and zinc citrate/triclosan dentifrices for the reduction of supragingival calculus formation**

Fairbrother KJ, Kowolik MJ, Curzon ME, Muller I, McKeown S, Hill CM, Hannigan C, Bartizek RD, White DJ  
Procter and Gamble Company, USA.  
J Clin Dent 1997;8(2 Spec No):62-6

Three triclosan-containing 'multi-benefit' dentifrices were compared for clinical efficacy in reducing supragingival calculus formation following a dental prophylaxis. A total of 544 subjects completed a double-blind parallel-group clinical study using the Volpe-Manhold Index (VMI) to record severity and occurrence of supragingival calculus. The study design included a pre-test period where the calculus formation rate was measured in subjects brushing with a placebo dentifrice. Following a prophylaxis, subjects were stratified for age, gender and VMI scores and assigned to one of four treatments: 1) a dentifrice containing 5.0% soluble pyrophosphate/0.145% fluoride as NaF/silica abrasive/0.28% triclosan (hereafter PPI/TCS - comparable to Crest (R) Complete dentifrice, Procter and Gamble, UK); 2) a commercial dentifrice containing 2.0% Gantrez(TM) acid copolymer/0.145% fluoride as NaF/silica abrasive/0.30% triclosan (hereafter Gan/TCS - Colgate (R) Total dentifrice, Colgate-Palmolive Company, UK); 3) a commercial dentifrice containing 0.5% zinc citrate trihydrate/0.15% fluoride as sodium monofluorophosphate/silica abrasive/0.20% triclosan (hereafter Zn/TCS - Mentadent (R) P dentifrice, Unilever, UK); and 4) a control dentifrice comprised of 0.145% fluoride as NaF/silica abrasive (hereafter Control). Subjects were instructed to use their assigned dentifrice at least twice per day and to brush

as they do normally. Supragingival calculus formation was assessed at two and four months using site-specific and whole-mouth VMI indices for both calculus severity and occurrence. Following four months of use, the PPI/TCS dentifrice provided statistically significant reductions in calculus severity (22-23%) and occurrence (15%) as compared with the Control dentifrice. The Zn/TCS dentifrice also provided significant reductions in calculus severity (17-19%) and occurrence (12-13%) as compared with the Control. The Gan/TCS produced no statistically significant reductions in calculus formation (occurrence or severity) compared with the Control. The PPI/TCS dentifrice provided statistically significant reductions in calculus severity (15-21%) and occurrence (12-16%) as compared with the Gan/TCS dentifrice. These results support the clinical effectiveness of PPI/TCS and Zn/TCS dentifrices for the reduction of supragingival dental calculus formation following a dental prophylaxis.

### **Vitamin-C, oral scurvy and periodontal disease.**

Touyz LZ  
S Afr Med J 1984 May 26;65(21):838-42

Scurvy and periodontitis both manifest gingival bleeding but constitute separate entities. Defective collagen in scurvy reflects many symptoms emanating from deficient Vitamin-C physiology. The various periodontal diseases are caused by oral plaque micro-organisms, the body's reaction to which is strongly influenced by inadequate functioning of leucocytes and monocytes. Although certain infections and systemic diseases cause gingival bleeding, avitaminosis C does not cause commonly encountered periodontal disease, but will aggravate established periodontitis. Vitamin-C should not be used for prophylaxis or cure of periodontitis in healthy well-nourished individuals. A patient with bleeding gingivae warrants referral to oral medicine and periodontics specialists for examination and treatment. (64 Refs.)

### **[Anticalculus dentifrices. A new era in preventive dentistry?]**

Collys K; Slop D; Coomans D  
Ned Tijdschr Tandheelkd. 1989 Dec;96(12):554-8.

Anticalculus toothpastes are available on the market. Toothpastes with Zinc compounds interfere mainly with the plaque formation. Dentifrices containing pyrophosphate give the highest reductions in calculus formation. The inclusion of pyrophosphate in a fluoride containing dentifrice did not interfere with the cariostatic action of fluoride on tooth enamel. The influence of anticalculus dentifrices on root caries and root hypersensitivity are, so far, not documented. Fundamentally, a lot of doubt still exists about the precise role of supragingival calculus formation in the onset of periodontal disease.

### **Effect of tea polyphenols on glucan synthesis by glucosyltransferase from *Streptococcus mutans*.**

Hattori M, Kusumoto IT, Namba T, Ishigami T, Hara Y  
Research Institute for Wakan-Yaku, Toyama Medical and Pharmaceutical University, Japan.  
Chem Pharm Bull (Tokyo) 1990 Mar;38(3):717-20

In the course of our studies on the development of anti-plaque agents for prevention of dental caries, we investigated effects of some of tea preparations and their individual components on the glucan synthesis catalyzed by glucosyltransferase (GTF) from *Streptococcus mutans*. Extracts of green tea and black tea, and polyphenol mixtures showed appreciable inhibition in the synthesis of insoluble glucan. Among the components isolated from tea infusions, theaflavin and its mono- and digallates had potent inhibitory activities at concentrations of 1-10 mM against GTF. (+)-Catechin, (-)-epicatechin and their enantiomers had moderate inhibitory activities at these concentrations, while galloyl esters of (-)-epicatechin, (-)-epigallocatechin and (-)-gallocatechin had increased inhibitory activities. Study on feasibility of Chinese green tea polyphenols (CTP) for preventing dental caries]

### **[Study on feasibility of Chinese green tea polyphenols (CTP) for preventing dental caries].**

You SQ  
Department of Stomatology, Ning bo First Hospital.  
Chung Hua Kou Chiang Hsueh Tsa Chih 1993 Jul;28(4):197-9, 254

This study demonstrated that streptococcus mutans could be inhibited completely after contacted with 0.1% CTP for 5 minutes. There were no drug resistance after repeat cultures in 0.025% CTP. Plaque Index and Gingival Index decreased significantly ( $P < 0.001$ ) after 0.2% CTP were used to rinse and brush the teeth. Results proved that CTP is an effective agent to prevent dental caries.

### **[Management of gingival inflammation with active ingredients in toothpaste]**

Lange DE; Lubbert H; Omid A  
Dtsch Zahnarztl Z (Germany, West) Jun 1975, 30 (6) p382-4

In order to study the effect of active additives in toothpastes, three different toothpastes were tested in 60 persons for a period of four weeks.

### **Evidence for enhanced treatment of periodontal disease by therapy with coenzyme Q.**

Matsumura T; Saji S; Nakamura R; Folkers K  
Int J Vitam Nutr Res (Switzerland) Apr 1973, 43 (4) p537-48

No abstract.

### **Zinc in etiology of periodontal disease.**

Polenik P  
Med Hypotheses (England) Mar Stomatological Clinic, Medical 1993, 40 (3) p182-5

Microbial plaque is the main etiological factor of periodontal disease. The bacterial polysaccharides stimulate gingival neutrophils and macrophages to interleukin-1 (IL-1) production. IL-1 causes a complex of redistribution processes with liver as the central organ. Accumulation of zinc in liver and their copper and ceruloplasmin production also elicits increase of copper and decrease of zinc in gingiva. The elevated level of copper in connection with zinc deficiency in gingiva causes the increase of permeability of gingival epithelium for bacteria. The stimulated inflammatory infiltrate produces more IL-1 and the vicious circle is complete.

### **Diabetes and periodontal diseases. Possible role of Vitamin-C deficiency: an hypothesis.**

Aleo JJ  
J Periodontol (United States) May 1981, 52 (5) p251-4

An hypothesis is proposed relating the possible role of vitamin deficiency as an etiologic factor contributing to periodontal disease in diabetes. The hypothesis is based upon the following:

- (1) transport of ascorbate across cell membranes may be impaired by glucose, but facilitated by insulin;
- (2) glucose utilization is significantly accelerated by sublethal concentrations of endotoxin;
- (3) endotoxin-induced histamine sensitivity of tissue is enhanced by a scorbic deficiency; and
- (4) ascorbic acid deficiency alters mucosal barrier function. The interrelationship of these factors is discussed.

### **Relationship of mineral status and intake to periodontal disease.**

Freeland JH; Cousins RJ; Schwartz R

A periodontal index (PI), based on visual and radiographic data, was used to evaluate the severity of periodontal disease in a group of 80 dental patients. The average PI was 3.1 +/- 1.8 SD (0=no detectable lesions, 8=most severe lesions). The PI was directly related to patient age ( $r=0.73$ ;  $P$  is less than 0.01). The serum concentration of calcium, copper, iron, magnesium, manganese, and zinc was measured. Regression of PI on the serum constituents demonstrated that serum copper was linearly related ( $r=0.64$ ;  $P$  is less than 0.001) to the PI. The other serum parameters were not correlated to the PI. Dietary protein, calcium, and vitamin A were slightly related to the PI, based on a 24-hr dietary recall. Dietary trace elements were not related to the PI. These results indicate that the serum copper concentration, in some way is related to the severity of periodontal disease. Possibly the observation is linked to the role of copper in the inflammatory response since inflammation is a characteristic of periodontal disease.

### **Comparative in vitro activity of sanguinarine against oral microbial isolates.**

Dzink JL, Socransky SS  
Department of Periodontology, Forsyth Dental Center, Boston, Massachusetts 02115  
Antimicrob Agents Chemother 1985 Apr;27(4):663-5

MICs of sanguinarine were determined for 52 oral reference strains and 129 fresh isolates from human dental plaque. Sanguinarine was found to completely inhibit the growth of 98% of the isolates at a concentration of 16,ug/ml.

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4. Hannan JJ, Johnson J, Kufnec MM : Long term clinical evaluation of sanguinaria tooth paste and oral rinse controlling plaque, gingivitis, and sulcular bleeding during orthodontist treatment . J Dent Res 1988;67:572

### **Clinical efficacy of a dentifrice and oral rinse containing sanguinaria extract and zinc chloride during 6 months of use.**

Harper DS, Mueller LJ, Fine JB, Gordon J, Laster LL  
Fairleigh-Dickinson University, Oral Health Research Center, Hackensack, NJ.  
J Periodontol 1990 Jun;61(6):352-8

The efficacy of combined use of toothpaste and oral rinse containing sanguinaria extract and zinc chloride was compared to placebo products in a 6-month clinical trial. Sixty subjects with moderate levels of plaque and gingivitis were randomly assigned to active and placebo groups. Noninvasive measures of plaque and gingivitis were assessed at baseline and at 2, 6, 8, 14, 20, and 28 weeks. Bleeding on probing was measured at baseline and 6, 14, and 28 weeks. Active group scores were significantly lower ( $P$  less than .0001) than placebo scores at each post-baseline time point for all indices, with the exception of plaque at 2 weeks. The 28 week active group scores were 21% lower than the placebo group for plaque, 25% lower for gingivitis, and 43% lower for bleeding on probing. No dental staining or taste alteration was reported in the active group. Three of 30 active group subjects exhibited minor soft tissue irritations that resolved spontaneously without discontinuation of product use. Results indicate that the test products showed good levels of safety and efficacy when administered in a combined use regimen for 6 months.

### **Clinical effect of a sanguinaria dentifrice on plaque and gingivitis in adults.**

Mallatt ME, Beiswanger BB, Drook CA, Stookey GK, Jackson RD, Bricker SL  
Indiana University School of Dentistry, Oral Health Research Institute, Indianapolis.  
J Periodontol 1989 Feb;60(2):91-5

A clinical trial was conducted to evaluate the effects of a sanguinaria-zinc chloride dentifrice on the prevention of plaque formation and gingivitis. A total of 59 young adults, 18 to 30 years of age, either performed supervised brushing with a 0.075% sanguinaria-0.05% zinc chloride dentifrice, a 0.24% sodium fluoride dentifrice, or rinsed daily with a 0.05% NaF solution. Clinical evaluations for plaque and gingivitis were performed after 7, 14, and 21 days of the test regimen. After 21 days, all subjects resumed twice daily supervised brushing and flossing and post-test evaluations were conducted after two weeks. The results showed that after 7, 14, and 21 days both groups using dentifrices had significantly less plaque and gingivitis than the group using the rinse, and there were no significant differences between the two groups using either the sanguinaria-ZnCl<sub>2</sub> or the NaF dentifrices.

**Supplementation or local application may reduce gingival exudate from inflamed and infected gums - which suggests improved tissue health. (Folate mouthwash appears to be more effective than oral folate.)**

J Clin Periodontol 14(6):315-9, 1987

Experimental Double-blind Study: 60 pts with visible gingivitis rinsed for 1 min. twice daily with either 5 ml of 0.1% folate solution (1 mg/ml) or a placebo. After 4 wks., the folate gp. was significantly improved compared to the placebo group. Dietary folate did not correlate with treatment results, suggesting a local effect (Pack ARC. Folate mouthwash: Effects on established gingivitis in periodontal patients. J Clin Periodontol 11:619-28, 1984).

Experimental Double-blind Study: 30 women in their 32nd wk. of pregnancy randomly received either placebo mouthwash and placebo tablets (Gp. A), placebo mouthwash 1 min. twice daily and folate 5 mg/d (Gp. B), or a 1% folate mouthwash and placebo tablets (Gp. C). After 28 days, folate levels increased significantly in Gps. B and C. Gp. C showed a highly significant improvement in a gingival index despite no significant changes in a plaque index ( $p < 0.01$ ) while there were no significant changes in Gps. A or B (Thomson ME, Pack ARC. Effects of extended systemic and topical folate supplementation on gingivitis of pregnancy. J Clin periodontal 9(3):275-80, 1982).

Experimental Double-blind Study: 30 women in their 4th or 8th mot of pregnancy randomly received either placebo mouthwash 1 min. twice daily and placebo tablets (Gp. A), placebo mouthwash and folate 5 mg/d (Gp. B), or 1% folate mouthwash and placebo tablets (Gp. C). The gingival index tended to increase throughout pregnancy in all gps. except Gp C, for whom there was a highly significant improvement in the 8th mot despite no change in plaque index. Compared to Gps. A and B, dietary intake of folate was significantly higher in Gp. C in the 8th mot ( $p < 0.01$ ) (Pack ARC, Thomson ME. Effects of topical and systemic folic acid supplementation on gingivitis in pregnancy. J Clin Periodontol 7(5):402-14, 1980).

Experimental Double-blind Study: 30 pts. with normal fasting blood folate levels rinsed their mouths daily with 5 cc of a 1 mg/cc folate solution or placebo. After 60 days, experimental subjects showed significant improvement in gingival health compare to controls (Vogel RI et al. The effect of topical application of folic acid on gingival health. J Oral Med 33(1):20-22,1978).

Experimental Study: Contraceptive users with normal plasma folate levels demonstrated improved gingival health after receiving supplementation with folic acid 4 mg/d for 60 days (Vogel RI et al. J Prev Dent 6:221, 1980).

Experimental Double-blind Study: 30 ptS. ingested either folic acid 2 mg twice daily or placebo. After 30 days, based on plaque and gingival indices, folic acid supplementation appeared to increase the resistance of the gingiva to local irritants leading to a reduction in inflammation. Plasma folate levels, which were normal, were unaffected by supplementation (Vogel RI e' al. The effect of folic acid on gingival health. J periodontol 47(11):667-8, 1976).

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