



Enamel Therapy: The Next Generation of Care

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A changing paradigm in caries management has introduced greater options in preventive oral healthcare over the last several years. With terms such as “minimally invasive dentistry” and “remineralization technologies,” it becomes our challenge to revisit the caries model and the methods we have utilized to diagnose and treat caries disease. This program will outline the changing trends in diagnostic technology, topical fluorides, dietary patterns and remineralization therapies that mark the new direction in preventing demineralization, caries and enamel erosion.

Course Objectives:

- Discuss historic trends in the management of caries in all patient profiles and age groups.
- Identify the diagnostic changes utilized in evaluating the caries process.
- Discuss and implement the use of the CAMBRA and other risk assessment tools.
- Identify the practice settings and patient clientele that benefits from the remineralization therapies.
- Discuss the latest diagnostic technology in screening and tracking caries patterns.
- List the key steps in the medical model in identifying and treating caries.
- Compare and discuss the current delivery systems which contain technologies claiming enamel restoration and remineralization.
- Evaluate and challenge the concept of “selective polishing” with consideration to remineralization benefits in prophylactic pastes.
- Formulate an effective treatment plan in enamel therapy.

I. Current Challenges to Dental Enamel

A. Today's Trends!

- i. New statistics on soda consumption
- ii. Consumer market growth with “energy drinks”, “sports drinks” and caffeine additives
- iii. Normal enamel wear and loss of minerals
- iv. Emerging challenges:
 - Eating disorders in young adult women
 - Obstacles in implementing fluoridated water supply
 - Salivary disturbances with drug usage and cancer treatment/oral conditions

B. Common Disorders affecting Enamel and Dentin Structures

- i. Dentinal hypersensitivity (Cause?)
 - Erosion – smooth patterns associated with acidic liquids (soda, lemons etc.)
 - Abrasion (mechanical, gingival recession, trauma)
 - Recommendations with dietary implications causing enamel erosion
 - Wide market of products to treat “symptoms”

C. Caries Models

- i. Traditional: demineralization affected by (3) environment, diet and bacteria
- ii. Emerging new models now highlight factors that impact diagnosis and treatment choices:
 - Saliva – flow amount, rate and ability to buffer pH
 - Extent of Fluoride exposure to host

D. Factors Affecting Rate of Demineralization/Dental Caries

- i. *Microflora*
 - Mutans Streptococci and Lactobacillus (pH 3.8 - 4.8)
 - Young vs. mature bacterial plaque affects rate of demineralization as well as rate of recovery during remineralization in the presence of saliva.
- ii. *Time*
 - Frequency of fermentable carbohydrate intake

- Timing around bacterial challenges
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- iii. *Diet*
 - Discourage high sugar intake/soda and energy/sport drink consumption
 - Xylitol/Recaldent chewing gum – great to replace sweet snacks
 - a. Recommended for use by both caregiver/parent and child
 - Brush “before” snacks; follow snack/sugar intake with water rinse to neutralize
 - Caution with the latest, popular “sour” candies in adolescents
 - a. **pH Chart** guides DH to educate on the impact of low pH consumption
- iv. *Host*
 - Risk factors define susceptibility in parents, siblings
 - Prenatal Prevention: use of Xylitol products before birth prevents vertical transmission
 - Pre-existing decay – Best predictor of future risk of caries!
 - Gender prevalence is higher in women: Hormone-driven sweet cravings
 - a. “Sex and The City” syndrome – sweeter and acidic alcoholic drinks preferred

E. Role of Saliva in Demineralization/Remineralization

- i. Definition of demineralization: loss of mineral content in enamel caused by organic acids produced when bacteria feed on fermentable carbohydrates on susceptible host
 - Critical that acid in oral environment is neutralized to halt demineralization stages
 - Concentration of Ca and P ions are greater on outside of enamel surface; then minerals will revert into the tooth to activate the process of remineralization.
- ii. Physical Characteristics associated with salivary dysfunction:
 - Use of Medications in adult and young patients
 - Radiation-induced caries – physical appearance
 - Systemic diseases affect the moisture required in the oral environment
- iii. **pH Scale:** Reference to these charts are very useful in practice to educate patients on the misuse of acid-related drinks
 - Testing of oral pH can be accomplished at chairside as part of risk assessment.

New Decisions in Enamel Therapy

- iv. New paradigm exists in assessment, diagnosis and treatment of caries prevention.
- v. Demographics show significant changes in WHO is now at risk for dental caries.
- vi. What do we know about the emerging preventive technologies in treating demineralization?
- vii. ACP technology exists and shows great potential in arresting caries patterns.
- viii. Implementation of effective treatment protocol using evidence-based research.

F. Changing Paradigms

<p>Extension for Prevention – G.V. Black</p> <ul style="list-style-type: none"> • Treating the symptoms rather than the etiology • Extended the cavity prep to ensure removal of bacterial-infected tooth & prevent progression of disease? • Before “adhesive dentistry” emerged in restorative procedures • Necessary to create a “retention” architecture to the tooth prep which meant sacrificing tooth structure 	<p>Minimally-invasive Dentistry: follows a “<i>medical mode</i>”</p> <ul style="list-style-type: none"> • Treats the etiology rather than symptoms • Conserves tooth structure • Recognizes caries as a bacterial infection and is contagious! • “Caries” is a DISEASE PROCESS and not the lesion! • Early detection of a carious lesion is reversible <p><i>Minimally-invasive World Congress meets annually</i></p>
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II. Medical Model (MID)

A. Methodology

- i. Caries Risk Assessment (CAMBRA)*
NEW LY updated CAMBRA forms available for download and duplication on the ADA site:
<http://www.ada.org/prof/resources/topics/caries.asp>
Or: on the California Dental Association site: www.CDA.org
also look at <http://www.carifree.com/dentists/downloads.html>
- ii. Visual/Clinical Examination/Radiographic
- iii. Dietary Assessment
- iv. Saliva Testing
- v. Bacterial Assay
- vi. Plaque Assessment/Dental Education
- vii. Treatment Plan
 - Preventive Therapies** (Inclusion of new remineralization & desensitization therapies)

B. Tomorrow’s Challenges

- i. Healthcare crisis in the United States is real!
 - Low income populations have a higher incidence of caries in recent ADA research
- ii. Older adults will retain their natural dentition – prevention generation
- iii. Number of medications used to treat diseases continues to grow
- iv. Alarming rise of erosive enamel patterns:
 - Meth Mouth and Bulimia create significant challenges to the dental team
 - Cancer Treatment comes with the side effects of Xerostomia and erosive changes to enamel/dentin.
 - GERD – a commonly diagnosed disorder that impacts the oral conditions (*Gastro Esophageal Reflux Disease*)

C. RISK Assessment – CAMBRA (“Caries Management by Risk Assessment”)

- i. **The Evolution of the CAMBRA Coalition on West Coast**
 - Includes all stakeholders: research, educators, dental industry, clinical practitioners, organized dentistry, government-assisted agencies, state licensing boards and third party payers.
 - Dr. Featherstone created a slide that demonstrates how Pathologic Factors compared against Protective Factors determines “risk level of patient”
- ii. Traditional Caries Management:
 - Dental Caries – Destroys teeth – Surgical intervention
 - Use of explorer to assess clinical disease in enamel surfaces?
 - Radiographs – their use and effectiveness in PREVENTING caries?
- iii. Defining **CAMBRA**

- “Caries management by risk assessment represents evidence-based approach to preventing, reversing and treating dental caries” (Young, 2007)
- iv. Defining **Risk Assessment**
 - “Risk assessment is an estimation of the likelihood that an event will occur in the future” (Ramos-Gomez F 2007)
- v. **PreViser** – online risk assessment to track electronically for patient care.
- vi. **JADA Reprint** (ADA Council on Scientific Affairs, Aug. 2006)
Key Points gained from this council's conclusions:
 - **Low risk** patients receive no significant benefit in topical fluoride application
 - 1 min. topical fluoride gel/foams – **no clinical** evidence in caries reduction (*lab studies only*)
 - **4 min.** topical fluoride gel/foams – show significant caries reduction (*clinical data*)
 - Topical fluoride varnish demonstrates effective prevention in caries
 - a. Every 6 months in child/adolescents – primary and permanent teeth
 - b. 2 or more application/year in high risk patients – any age
 - c. Minimal ingestion, takes less time to apply

D. DETECTION TECHNOLOGIES

- i. Danger of instrumentation during examination – use of explorers are tentative
- ii. Use of visual inspection of tooth luster, texture, discoloration and translucency provides effective evaluation of enamel changes/demineralization and potential subsurface carious patterns
- iii. Radiographs
 - Cannot determine active caries progression
 - 45-60% demineralization exists before visual appearance on a radiograph
 - Low sensitivity (30%) on the Occlusal surface; (50%) on Interproximal surfaces
- iv. Diagnostic Values:
 - SE: sensitivity is probability that a test will correctly identify demineralization
 - SP: specificity is the probability that a test will correctly identify sound enamel
 - R: reliability is the dependability or consistency of a measurement method
- v. Diagnostic Technology
 - Laser Fluorescence (Diagnodent, KAVO)
 - QLF – Quantitative Light Fluorescence (InspektorPro, 3M/Omni)
 - Red-Infrared Reflectance (Midwest Caries I.D.- Dentsply Professional)
 - Light Induced Fluorescence (Sopro life- Acteon & Spectra - Air Technique)

E. Treatment Planning

- i. Assess Risk Factor of Patient based on AGE grouping:
 - MED - HIGH RISK:
 - a. Select further tests that provide direction in treatment design
 - i. Bacterial assay, saliva tests, Disclosing plaque, referral for medical tests for unknown systemic factors, Plaque assessment
 - b. Salivary dysfunction may implicate higher risk with adults on multiple drugs, systemic diseases, dietary habits or cancer therapy
 - **Age and Compliance** are factors that bear significant importance in choosing a therapy:
 - a. Professionally-applied products are better choices for non-compliant and younger patients (topical fluoride varnish, fluoridated prophylaxis pastes, MI Paste, Fluoride gels in trays, sealants.
 - b. Products used at home/by patient : MI Paste, 5000ppm fluoride pastes/gels and Chlorhexidine rinses are best prescribed to adults and compliant patients

III. Remineralization Therapies

A. Traditional Enamel Therapy

i. Fluoride

- Supports natural remineralization
 - a. Inhibits bacterial metabolism
 - b. Inhibits demineralization
 - c. Promotes remineralization
- **Indications for Fluoride**
 - a. White spots (demineralized lesions)
 - b. Moderate to higher risk patients for developing caries
 - c. Active caries
 - d. Orthodontic therapy
 - e. Non-fluoridated water supply regions
 - f. Reduction of tooth sensitivity
 - g. Protection of root surfaces (gingival recession, gingival margins of crowns)
 - h. Patients undergoing head and neck radiation therapy
 - i. Decreased salivary flow (drugs, chronic systemic diseases)
 - j. Institutionalized patients (children, elderly)
 - k. Physically-challenged patients
- **Sources** (Topical and Systemic)
 - a. Systemic: 1,000-2,000ppm in outer enamel and 20-100ppm in subsurface during development
 - b. Topical: 30,000ppm
 - c. Optimal salivary concentration:
 - i. 0.1ppm for high risk patients
 - ii. 0.02-0.04ppm for low risk patients
- **Fluoride in Public Water**
 - b. One of the greatest achievements of the 20th century (CDC)
 - c. Approximately 70% of all cities in the U.S. with population over 100,000 have fluoridated water supply
 - d. Systemic fluoridation reduces enamel caries in adults by 20-40% and 8-37% in adolescents. (RDH Jul 2006, Nathe, C)

ii. Pit and Fissure Dental Sealants

- 98% effective in preventing caries
- Applied on all primary/permanent teeth revealing susceptible tooth anatomy and inability to keep plaque retained in Occlusal /buccal pits
- When do we apply a sealant or fluoride varnish?

IV. Anti-bacterial Therapy

- i. Bacterial caries can be reduced or prevented using anti-bacterial agents
 - Supporting minimally-invasive dentistry
- ii. Anti-bacterial agents used in practice
 - Chlorhexidine* (used 1X/day for 1 week per month; repeat for six months)
 - Essential Oils (Listerine)* (Use 2X daily every day)
 - Xylitol*
 - Iodine
 - Fluorides*
 - Peroxides
 - Baking Soda

* (Most effective and widely-used in practice today)

V. XYLITOL

- i. Very effect “anti-bacterial agent” that interferes with bacterial metabolism when at highest ingredient inclusion of a product
- ii. 5 Carbon sugar alcohol used as a sugar substitute
- iii. Naturally occurring sweetener found in fibers of fruit, berries, vegetables, corn husks, oats and mushrooms.
- iv. Contains 2/3rds the food energy.
- v. Very effective against Lactobacillus strain of oral bacteria (associated with caries)

- vi. MUST be the highest ingredient (first named in list) in gums, candies, mints to be used as an anti-bacterial agent

VI. The Role of Topical Fluoride Varnish

- A. Varnish is classified as a “medical device” not a drug (FDA)
 - i. Presents minimal risk and are subject to the lowest level of regulation
 - ii. “On label use” for desensitization and cavity varnish (United States)
 - B. Origin and introduction in dentistry
 - i. Fluoride-containing varnish was first introduced in Germany in 1964 as Duraphat (*Colgate*)
 - ii. In 1991, fluoride varnish became available in the U.S. when FDA approved Duraflor.
 - Used primarily as a desensitization medicament – topically and localized sites
 - C. ADA supports the use of fluoride varnish for caries prevention therapy for medium-high risk patients
 - i. **CODES for Fluoride Treatments:**
 - **D1203** – Topical Fluoride TX – 14 years or younger
 - **D1204** – Topical Fluoride TX – over 14 years of age
 - **D1206** – Topical Fluoride Varnish TX (**NEW CDT CODE**)
 - a. Only applied when varnish is used in full mouth application
 - b. Therapeutic application for moderate to high risk patient case
 - c. Must be performed in a “single visit”
 - d. Should have a supportive narrative accompanying insurance submission
 - e. Not to be confused with Desensitization Code that still exists for localized application of fluoride varnish – **D9910**
 - ii. **ADA recommends fluoride varnish for:**
 - Desensitization
 - Caries prevention
 - Efficient means of getting fluoride on very young with minimal/or no ingestion
 - D. **Features that supports full mouth application**
 - i. Latest improvements in esthetics and unit dose ease of application
 - ii. Ease of use and safety during application
 - iii. Highest concentration of ppm compared to all other fluoride deliveries
 - Varnish 22,600 ppm
 - APF 12,300 ppm
 - NaF 9,000 ppm
 - Rinse 3,300 ppm
 - E. **Directions for Use**
 - i. Dry teeth with gentle air or gauze
 - ii. Apply thin layer to all surfaces of teeth
 - iii. Wipe brush before reinsertion to product cup and intra-orally
 - iv. Due to components in the varnish, the material dries on contact
 - F. **Post-Treatment Directions**
 - i. Allow varnish to remain on teeth for at least 4-6 hours following application
 - ii. Instruct patient not to brush or floss for remainder of that day
 - iii. Eat soft diet and avoid extreme temperatures of food/drink or alcohol
 - iv. Discontinue any supplemental fluorides used at home for several days
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VII. Emerging Technologies in Remineralization/Desensitization

A. ACP

- i. Research conducted by Dr. Ming Tung ADA Health Foundation NIST at the Paffenbarger Research Center, Gaithersburg, MD
- ii. ACP (amorphous calcium phosphate is inorganic and highly soluble
- iii. ACP is created when dissolved calcium and phosphate ions react to form a precipitate incorporated into the enamel tooth structure

- iv. Speeds up the kinetic reaction of natural rebuilding properties of enamel
- v. Intra-oral saliva activates the ACP for immediate delivery to tooth surface and supercharges saliva with greater Ca and PO₄ concentration remaining in the oral cavity
- vi. The positive ions of Ca and PO₄ are chemically attracted to the negative ionic charge of Fluoride, further creating greatest uptake of Fluoride into the enamel surface.
- vii. Ca and PO₄ binds with F₂ and released during acid attacks (Fluorapatite layer forms and is stronger than original hydroxyapatite layer in enamel)

viii. Products containing ACP:

- Arm & Hammer: Age-Defying Toothpaste with ACP by Church and Dwight
- Enamel Pro® prophy paste with ACP, 5% NaF Clear Varnish and Enamel Pro Non-acidulated Fluoride Gel with ACP (by Premier Dental)
- Zoom Day White/Nite White Whitening with ACP and Relief Gel by Discus Dental
- Aegis Dental Sealant, Cements and Adhesive with ACP by Bosworth Co.

B. RECALDENT™

- i. **CCP-ACP** (Casein phosphopeptides-amorphous calcium phosphate)
 - a. derived from casein, a protein in cow's milk
- ii. CCP keeps the ACP in its amorphous soluble form
- iii. Discovered and patented at University of Melbourne, Australia
- iv. Binds to tooth surface and plaque
- v. First used in Australia under the product name: Tooth Mouse (Australia); In the U.S., product is called MI Paste/ MI Plus Paste and also contained in Trident Chewing Gum
 - Intended use as a desensitization paste (in-office or at home)
 - 3-5 minutes contact time for greatest absorption

C. NOVAMIN®

- i. **Calcium Sodium Phosphosilicate:** Synthetic material containing calcium, phosphorous, sodium and silica
- ii. Developed by Drs. Litkowski, Hack University of MD with Dr. D. Greenspan at NovaMin Technology Inc. – Florida.
- iii. Used in bone repair and bone regenerative materials for many years
- iv. Its chief mechanism of action is its ability to occlude tubules for desensitization
- v. Ca and PO₄ are protected by the silica (glass-like material) and sodium used for buffering of saliva until it comes in contact with Ca and PO₄ to precipitate
- vi. 2-3 minutes contact time recommended to allow the hydroxycarbonate apatite and NovaMin particles to occlude dentinal tubules.
- vii. Products powered by NovaMin technology:
 - SoothRx desensitization topical agent (Omni, 3M/ESPE)
 - NUPRO NuSolutions prophy paste in-office and 5000ppm dentifrice used at home (Dentsply)
 - DuraShield Plus Varnish, ReNew paste, VitalMin solution (Sultan Healthcare)
 - Oravive, DenShield are marketed in Europe, Asia.

D. Pro Argin® (formerly recognized in SensiStat)

- i. Chemical name: **Arginine bicarbonate**
- ii. Using amino acid complexes that bind to calcium to provide mineralizing transformation to tooth structure (calcium carbonate to dentin and enamel structures)
- iii. Marketed to address dentinal hypersensitivity (*formerly DenClude and ProClude by Ortek Tech.*)
- iv. Now called: Colgate® Sensitive Pro-Relief™ It can be used before or after dental procedures, such as prophylaxis and scaling. pressure and cold air
Instant and lasting sensitivity relief that last 4 weeks after a single application.

VIII. Conclusion:

- **In product selection, important considerations in making your choice:**
 - Identify appropriate product that delivers efficiently, effectively and safely
 - Review research and claims to ensure it is used appropriately
 - Follow CAMBRA to design your therapy plan by risk level of patient
 - Consider Age, compliance, risk level, patient abilities
 - Don't be afraid to make changes in your daily routine that benefits the patient's oral health!

Thank you!

- ✦ View the Enamel Pro ACP products and varnish application tutorials on the website
- ✦ References supporting this program may be located on the Premier Website under Dental/Seminars/Enamel Therapy references

Premier Website: www.premusa.com/dental/products

Any further questions, may be directed to Lcaperila@premusa.com at Premier Dental Products Company