

CAMBRA is minimally invasive dentistry

CAMBRA stands for "Caries Management By Risk Assessment" and should be your standard for treating patients. In simple terms, here's why.

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Dental caries is a transmissible bacterial infection that should be curable and preventable. Yet clinical treatment of this infection in the United States has been, and still is, largely based on the restorative model. Scientifically and ethically, simply restoring teeth does not in the long haul halt the disease process. This article will briefly summarize the scientific basis for CAMBRA. DPR's April issue will focus on practical implementation in your office.

The caries process and the balance theory

The etiologic agents of dental caries are Mutans streptococci (MS) and Lactobacilli (LB).¹ These bacteria can generate acids from fermentable carbohydrates. The level of infection that causes damage to teeth depends on multiple factors. Acids generated by these bacteria diffuse into the subsurface of the enamel and can dissolve calcium and phosphate, which then diffuse out of the tooth. This process is called demineralization.

If not halted, the continued loss of subsurface mineral will eventually cause the surface to cave in or cavitate. Once cavitated, a restoration is normally needed.

However, here's the good news—the presence of healthy saliva will provide buffers, and extra calcium and phosphate to reverse the early damage caused by demineralization. To do this repair, the salivary buffers must first neutralize the acid and stop the demineralization. When the calcium and phosphate concentrations become greater outside the tooth than inside, they will diffuse back into the tooth. This reversal of the demineralization process is called remineralization.

Whether the demineralization or remineralization process predominates depends on several factors, some protective and some pathogenic. The pathogenic factors include the bacteria MS and LB, salivary dysfunction, and poor dietary habits. The protective factors include adequate amounts of healthy saliva, baking soda products, sealants, antimicrobial agents, fluoride and other remineralizing agents, and an effective diet. Saliva is perhaps the most important factor because it contains so many items needed for health: calcium, phosphate, salivary antibacterial agents, enzymes, acid buffers, and protective proteins. Baking soda products may help neutralize acid in the mouth if saliva is inadequate. If pathogen levels are high, antimicrobial agents such as xylitol,² chlorhexidine,³ iodine,⁴ and perhaps other new products may help reduce them. Topical fluoride has been shown to aid in remineralization.

Several products deliver calcium and phosphate to the oral environment, including MI PasteTM (GC America), SootheRxTM (OMNII Oral Pharmaceuticals), Mentadent Replenishing WhiteTM and Arm and Hammer Enamel Care[®] (Church & Dwight), and

Trident White® (Cadbury Adams). Each of these products has different marketing claims and careful review is recommended.

Last, but not least, a healthy diet, including the decrease in the frequency of snacking, is needed for a healthy caries balance. This dynamic balance tips between demineralization and remineralization throughout the day and was first described by Featherstone as the "Caries Balance Theory" (Fig. 1).⁵

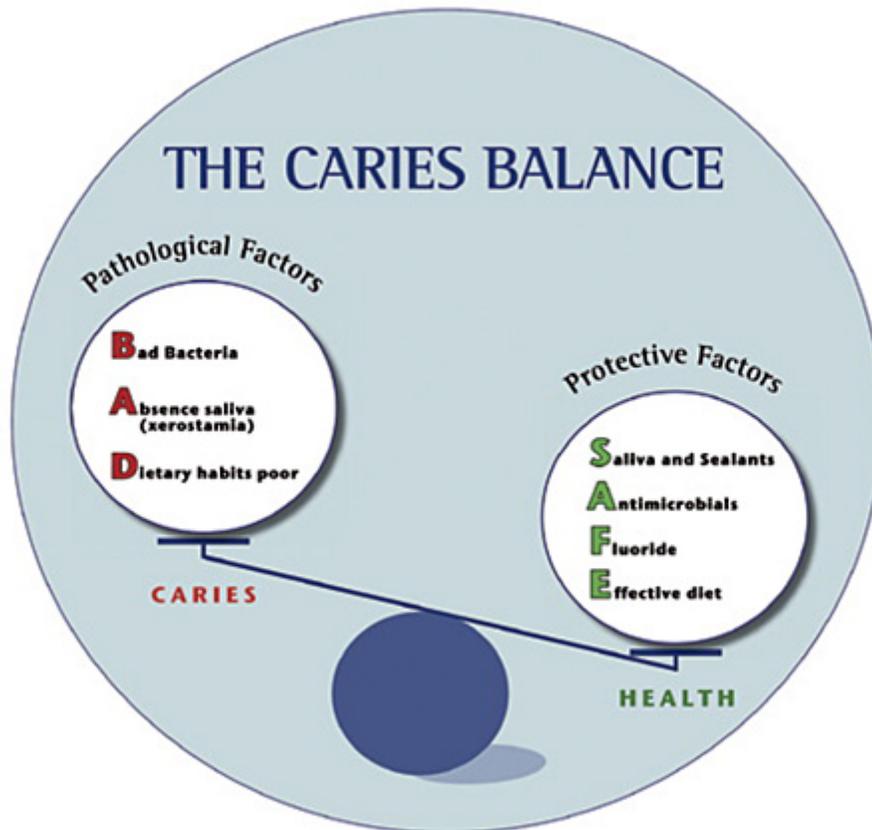


Fig. 1 The Caries Balance: Pathologic factors versus protective factors.

If the caries balance is heavily weighted in pathogenic factors, demineralization will prevail and eventually result in visible changes to teeth. The earliest visible signs of enamel demineralization appear as white spots, and later brown spots, in the enamel (Fig. 2). The enamel surface with white- and brown-spot lesions, although discolored, remain intact and are not cavitated.

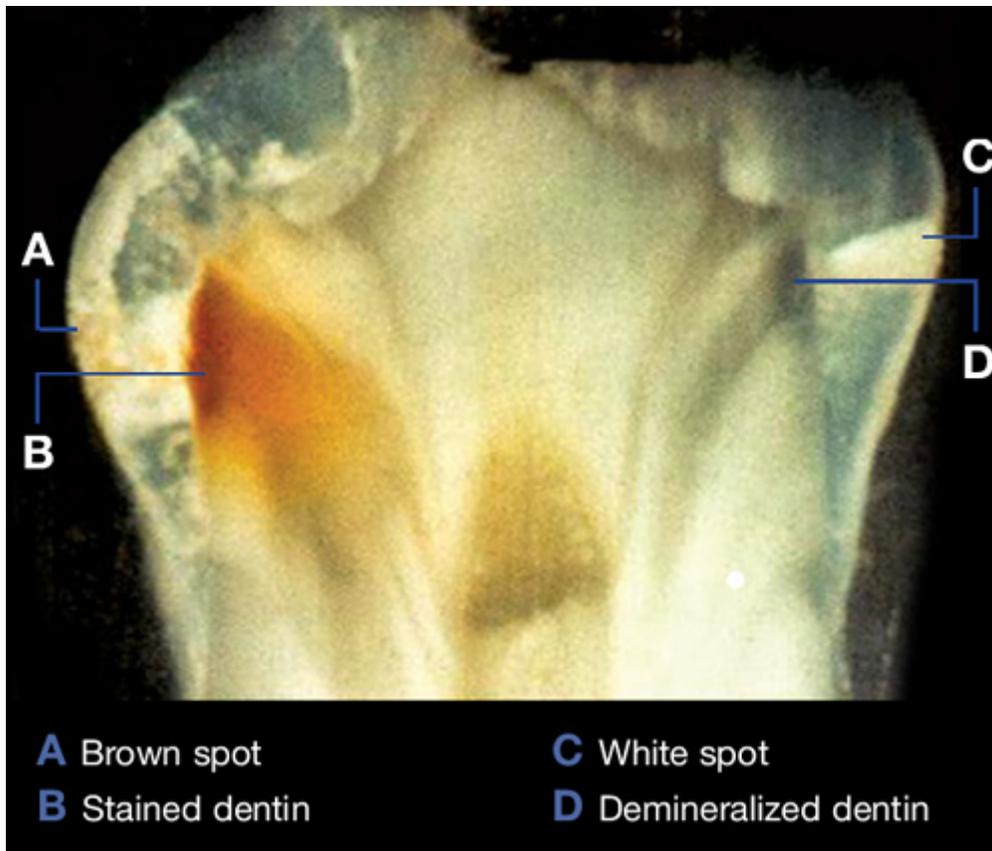


Fig. 2 Non-cavitated white and brown spot lesions.

An intact enamel surface is significant because it prevents bacteria, which are too large to diffuse through enamel, from getting into the tooth. If demineralization is not stopped, the surface can eventually cavitate. All forms of carious lesions (cavitated and pre-cavitated) should be thought of as "symptoms" of the caries disease process itself, with the real cause of the tooth damage being the result of bacterial infection, poor dietary habits, and possibly xerostomia. Thus, treatment should focus on treating the disease, not just repairing the symptoms by restoring teeth.

With CAMBRA, detection and treatment is focused not only on cavitated stages but also on the pre-cavitated stages, where chemical, rather than surgical, treatments are appropriate. It is important to treat lesions as early as possible in the pre-cavitated stages using strategies that reduce pathogens, inhibit demineralization, and enhance remineralization.⁶ Thus, CAMBRA, with its preventive and chemical strategies, is truly the cornerstone of minimally invasive dentistry (MID).

If a restoration is needed, ideally the best restorative material will be chosen based on lesion location and depth. Restoration can then be accomplished using the most minimally invasive means possible. Treatment is site-specific. Pits and fissures, roots, and smooth surfaces have significant differences and should be treated with different strategies.⁶

Assessing caries risk

The Caries Risk Assessment (CRA) measures the caries balance of a patient at a point in time, and information that is gathered drives the decision-making process in clinical treatment. Treatment is evidence-based and individual patients are treated according to their oral environment rather than treating all patients similarly. Treatment involves strategies that put the patient into a healthy balance.

For documentation purposes, it makes sense to use written or computerized forms consisting of a questionnaire that collects as much information as possible on the existing pathogenic and protective factors present. An example of a CRA and intervention form can be found on the World Congress of Minimally Invasive Dentistry website at www.wcmid.com.

A CRA should also include a baseline saliva test which measures stimulated flow rate (to rule out or diagnose xerostomia) and estimates the levels of pathogenic bacteria. Many feel this baseline salivary data is just as important to an examination as full-mouth radiographs and periodontal probing. The saliva tests are repeated as needed to monitor the progress of treatment and to motivate patient behavior. Changes in bacterial levels after antimicrobial therapy often require months of re-treatment interventions to produce a significant change because of the complex biofilm communities in which these pathogenic organisms exist. Persistence is the key to reducing pathogenic factors and increasing the protective ones. This will be covered in more detail in the April issue.

Proof CAMBRA works

A National Institute of Health-funded, university-based, multi-year, blinded, randomized clinical trial was recently completed by Featherstone et al. testing the validity of CAMBRA.⁷ In short, this study tested high-risk caries patients with simple interventions such as fluoride and chlorhexidine as needed based on the results of the CRA. The control group got conventional restorative care only. Results showed that the CAMBRA group reduced caries incidence in this high-risk population and merely restoring teeth did not. Our premise is that traditional restorative procedures alone do not effectively treat dental caries. It is time to change how we think about and treat this most common disease.

Each item listed earlier in this article as a pathologic or protective factor has decades of research supporting it. This article is a brief summary of the scientific basis of CAMBRA. For a more detailed review of this research, go to www.cdafoundation.org/journal where you can download, without charge, the February and March 2003 Journals of the California Dental Association. Both issues are a review of the literature supporting the scientific basis of CAMBRA. The March issue also has a consensus statement with sample CRA and intervention forms.

CAMBRA: How can you say "no"?

So basic is the scientific premise that dental caries is a bacterial infection that it would be hard to find a reason not to embrace the CAMBRA paradigm. Science has proven that treating the symptoms by restoring teeth alone will not eliminate dental caries. Why then the reluctance to implement CAMBRA into clinical practice? Is it because third party payers do not currently cover CAMBRA fees? Is it because of simple ignorance of CAMBRA? Is it because dental schools place so much emphasis on the technical hand skills necessary to restore the dentition that students graduate

with little appreciation for CAMBRA? The truth may hurt—the commonly accepted bio-ethical principles (see "Ethical principles," in related links below) make CAMBRA difficult to ignore.

WCMID annual meeting

At the World Congress of Minimally Invasive Dentistry annual meeting last August, we witnessed that the industry is responding with new technologies and products for CAMBRA (More on that in April). Several dentists shared how implementing CAMBRA has improved the way they practice. They reported how the use of science and cutting-edge technology has revitalized their interest in dentistry and how empowering dental assistants and hygienists to be more intimately involved with patient care has enabled dentists to provide more individualized care.

Dental school CAMBRA coalition

At the most recent WCMID meeting all nine western dental schools, the five California dental schools and the dental schools from Arizona, Oregon, Washington, and Nevada, gathered to work on advancing CAMBRA. The schools along with the members of the insurance industry, state funding organizations, and dental research organizations held a panel discussion on CAMBRA. They encouraged dental schools across the nation to organize by region and join the next WCMID meeting in Seattle, Aug. 16, 2006. For more information, go to www.wcmid.com.

Conclusion

Scientifically and ethically, CAMBRA provides the best possible and the most minimally invasive dental care for your patients. This is the standard our profession must promote.

References

1. Loesche WJ. Role of *Streptococcus mutans* in human dental decay. *FEMS Microbiol Rev* 1986;50:353-80.
2. Makinen KK, Isotupa KP, Makinen PL, Soderling E, Song KB, Nam SH, et al. Six-month polyol chewing-gum programme in kindergarten-age children. *Int Dent J* 2005;55(2):81-8.
3. Anderson MH. A review of the efficacy of chlorhexidine on dental caries and the caries infection. *J Calif Dent Assoc* 2003;31(3):211-4.
4. DenBesten P, Berkowitz R. Early childhood caries: an overview with reference to our experience in California. *J Calif Dent Assoc* 2003;31(2):139-43.
5. Featherstone JD. The caries balance: the basis for caries management by risk assessment. *Oral Health Prev Dent* 2004;2 Suppl 1:259-64.
6. Young DA. New caries detection technologies and modern caries management: Merging the strategies. *Gen Dent* 2002;50(4):320-31.

7. Featherstone JDB, Gansky SA, Hoover CI, Rapozo-Hilo M, Weintraub JA, Wilson RS, et al. A randomized clinical trial of caries management by risk assessment. *Caries Res* 2005;39:295 (abstract #25).

Related Links: [Ethical principles](#).

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