

# Empowerment Tools for the Dental Hygiene Profession

Shirley Gutkowski, RDH, BSDH

**T**he dental hygiene profession is varied and complex, but all too often, conversations with dental hygienists center on the monotony of the daily grind. Patient education has become so standardized that one lecturer jokes that she plays a tape of her home care instructions. Now, something new—minimally invasive (MI) dentistry—is coming to alleviate that daily tedium.

For decades, dental hygiene and dental students have been lectured and tested on the mechanics of enamel formation, caries initiation, and the treatment of decay with amputation of the infected site.<sup>1</sup> The words we use in dentistry, like drilling, have become sanitized for the benefit of patients and clinicians. However, sanitized nomenclature discounts the bacterial nature of caries. Practitioners have become accustomed to treating the lesion, not the disease.

As students, we learned that hydroxyapatite forms to make enamel.<sup>1,2</sup> As the tooth erupts into the mouth, the enamel is vulnerable to acid attack from bacterial metabolites and acidic foods.<sup>2,3</sup> The acid breaks the fragile bonds between the apatite molecules, liberating calcium and phosphates into the oral environment.<sup>4</sup> Saliva provides the tooth with replacement molecules in a medium that caresses the damaged portions. In a healthy mouth, this process occurs moment by moment without fanfare.

When fluoride is in the mix, the molecule becomes known as fluorohydroxyapatite, which adheres to the damaged enamel, and was much more resistant to decay than the original hydroxyapatite.<sup>2,4,5</sup> Under optimum circumstances, when fluoride, calcium, and phosphorus are available in the erupting tooth, the mix develops into a tooth that is resistant to all acid challenges.<sup>2,4,5</sup> As students, we learned the oral environment is seldom optimum because acidic food and biofilm metabolites continually attack the enamel, trying to break the bonds. We also learned that this is all happening at an unseen molecular level.

Upon graduation, new dental hygienists find that dentistry is practiced at the macro level. The closest dentistry comes to being microscopic is in the esthetic field when low pH compounds are used to create microtags for the materials to adhere to the tooth. These etching materials break the bonds of the hydroxyapatite, leaving fragile towers of enamel rods to act as rebar for the material, whether it's a resin sealant, a bonded restoration, or a glass ionomer.<sup>6</sup>

Dental hygienists know decay is a bacterial infection—it's a fact we learned in college. Yet very few clinicians use an antimicrobial to combat the

infection. Featherstone commented on the use of chlorhexidine as part of a protocol to re-establish an oral flora that would favor remineralization.<sup>4</sup> It's a viable consideration. A daily chlorhexidine bath for 2 weeks every 3 months seems to be enough to break the incessant cycle of new and recurrent decay.<sup>4</sup>

Traditionally, dental care providers revert to fluoride and oral hygiene instructions when confronted with a case of rampant decay, even though educators teach about a disease that is multifactorial.<sup>7</sup> There is more to addressing the disease than increasing the amount of fluoride available for making fluorohydroxyapatite. Destroying the bacteria, which is the medical model, and offering building blocks are 2 helpful ways to homeostasis.<sup>8</sup> Using the foundation of formal learning with applications of new products and expanded thinking—the MI approach—can turn dental hygienists into motivated clinicians again.

The MI approach to treating decay has 3 components: recognizing decay early, rejuvenating the oral cavity by maintaining homeostasis, and repairing the enamel at a micro and macro level of remineralization. In other words, MI dentistry uses evidence-based therapies to reverse the breakdown of enamel by applying nonsurgical techniques and modalities that intervene at the lowest level.

## Recognizing Decay Early

Recognizing decay early is critical to making MI dentistry work. To address decay at the earliest level, clinicians must be able to recognize either the actual breakdown or when conditions, which are not isolated to diet and home care, are at an optimum for enamel breakdown. Saliva composition is a big factor in this.

Cariogenic biofilms thrive in an acidic environment, which is partly created by food and beverage ingestion.<sup>9</sup> An acidic environment also can develop if the saliva is of a poor quality that is manifested as low pH.<sup>10</sup> In addition, poor quality saliva cannot be countered with a toothbrush. Dental hygiene

students are required to test saliva in a certain number of patients for a microscopic exercise. In dental practices, however, saliva seems to take on the role of a nuisance or a problem to overcome because many dental materials work best in a dry field. For a long time, chairside saliva testing was not readily available, and incubating saliva is very time consuming, so the acceptance of poor saliva continued.

Two chairside saliva quality and quantity tests are available to clinicians. CRT buffer (Ivoclar Vivadent, Amherst, NY, [www.ivoclarvivadent.us.com](http://www.ivoclarvivadent.us.com)) can tell clinicians within minutes if the buffering quality of the saliva is adequate. The system needs to be incubated to discern the numbers of bacteria present. In 2001, van Palenstein Helderma and colleagues reported that the amount or type of bacteria found in the saliva was unimportant.<sup>11</sup> The amount of bacteria in the biofilm is another issue, however, because bacteria living in a biofilm express a different genome than those that are free floating.<sup>12</sup> Therefore, it is my experience that testing bacteria and counting colony forming units won't help further establish a therapeutic protocol, but testing saliva quality might.

With Saliva-Check (GC America Inc, Alsip, Ill, [www.gcamerica.com](http://www.gcamerica.com)), a valuable diagnostic tool, the simplified color-coded results give an analysis of the resting and stimulated saliva buffering capacity and the pH, and provide visual cues to the quality and quantity of the saliva. If saliva quantity is low, increasing hydration is important and recent data suggests that patients evaluate their urine color to determine the level of fluid intake (light yellow urine suggests adequate hydration) because 64% of ingested water is excreted.<sup>13</sup>

An age-old option to recognize decay, radiographs have evolved to films that are faster and need less ionizing radiation to hit the film that creates the image. Radiographs have also gone digital, allowing clinicians to use even less radiation. Digital radiograph computer images can be manipulated to give even more clarity to the image or highlight certain conditions. Digital can also be zoomed in, giving clinicians a view of an area that is more conducive to early caries management.

Light energy—from trans-illumination systems like Difoti Digital Imaging Fiber-Optic Trans-Illumination (Electro-Optical Sciences, Inc, Irvington, NY, [www.difoti.com](http://www.difoti.com)), to laser detection of bacterial byproducts in Kavod Diagnost (Kavod America, Lake Zurich, Ill, [www.kavodusa.com](http://www.kavodusa.com)), to a system that measures the fluorescence of bacteria



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and tooth decay in QLF Vision (Inspektor Research Systems bv, Amsterdam, NL, [www.inspektor.nl/](http://www.inspektor.nl/) Omnia Oral Pharmaceuticals, West Palm Beach, Fla, [www.omniipharma.com](http://www.omniipharma.com))—has the ability to provide advanced therapies. An office without at least 1 of these advanced caries detection devices is working in the distant past.

MI only works when decay is recognized at the earliest stages. When homeostasis is no longer achievable and the scales tip to favor enamel breakdown, MI therapies using new detection devices directed by the dental hygiene department can protect the tooth from further breakdown without resorting to surgery or tooth amputation.

### Rejuvenating the Oral Cavity

Rejuvenating the oral cavity by maintaining homeostasis is accomplished by providing the teeth with the minerals they need to rebuild after an acid attack. At our disposal are things like arginine, calcium, fluoride, phosphorus, and xylitol.

Fluoride resides in plaque; it can be applied without polishing or brushing the teeth first.<sup>4,5,9</sup> Fluoride science has changed to increase dependency on low dose, long duration topical applications, such as Lozi-Flur lozenges (Dreir Pharmaceuticals, Inc, Scottsdale, Ariz, [www.dreirpharmaceuticals.com](http://www.dreirpharmaceuticals.com)). Research suggests that systemic fluoride does not provide the benefits the dental industry had thought for decades and is no longer considered necessary, even in children who live in areas where there is no municipal water fluoridation.<sup>5,14</sup>

Fluoride also works better when it's used with calcium and phosphorus.<sup>4,5</sup> Supplying these particles to saliva in a person with hyposalivation can effect the dentition profoundly because the teeth will have the building blocks necessary to fabricate fluorohydroxyapatite.<sup>4,5</sup> Currently, there are several toothpastes with calcium and phosphate available for consumer use. Enamel Care toothpaste (Arm and Hammer Oral Care, Church and Dwight, Princeton, NJ, [www.myoralcare.com](http://www.myoralcare.com)) has a tube design to keep the toothpaste separated from the liquid calcium-phosphate mix to discourage premature bonding of the ions until they are brought together in the mouth via a toothbrush.

Denclue (Ortek Therapeutics, Inc, Roslyn Heights, NY, [\[inc.com\]\(http://www.ortekinc.com\)\) incorporates calcium carbonate and arginine bicarbonate molecules that occlude the dentinal tubules, decreasing temperature and scratch sensitivity. Denclue also contains arginine, an amino acid that excites the basophilic bacteria that shifts the oral ecology toward a higher pH. Once Denclue is applied, the](http://www.ortek</a></p></div><div data-bbox=)

oral pH immediately shifts to a condition that favors homeostasis.

Oravive Tooth Revitalizing Paste (Novamin Technology Inc, US Biomaterials Corporation, Alachua, Fla, [www.novamin.com](http://www.novamin.com), [www.oravive.com](http://www.oravive.com)), which incorporates calcium and phosphorus, provides substantivity for a time after use, depending on

the acid challenges that are provided by diet or saliva quality.

Rejuvenation is also facilitated by the use of xylitol, which initiates and maintains a shift from harmful *Streptococcus mutans* to a strain that is less volatile and doesn't adhere to the tooth.<sup>15</sup> Squigle Enamel Saver Toothpaste (Squigle, Inc, Narberth,

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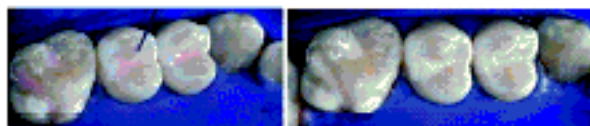
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Figure 1—White spot on canine reduced with CPP-ACP tray applications.

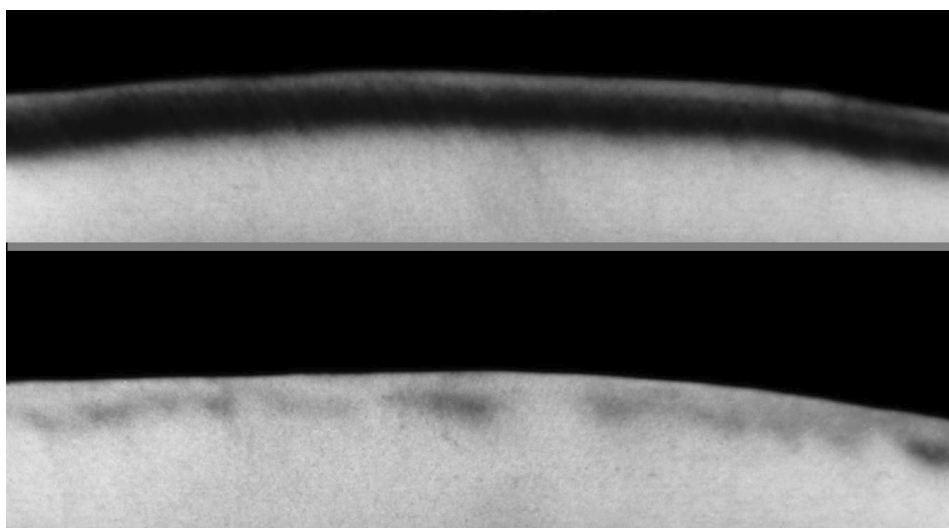


Figure 2—In vitro lesion showing intact surface over void and after application of CPP-APP.

Pa, [www.xylitoltoothpaste.com](http://www.xylitoltoothpaste.com)) contains the most xylitol of any over-the-counter brand; other toothpastes with xylitol include Biotène Dry Mouth Toothpaste (Laclede, Inc, Rancho Dominguez, Calif, [www.laclede.com](http://www.laclede.com), [www.biotene.net](http://www.biotene.net)) and Spry Coolmint Toothpaste (Spry Dental, Xlear Inc, Orem, Utah, [www.sprydental.com](http://www.sprydental.com), [www.xlear.com](http://www.xlear.com)). For a further discussion on the benefits of xylitol in maintaining homeostasis, use your favorite search engine and use the search string: xylitol caries.

## Repairing Teeth

In MI dentistry, repairing means providing teeth with the minerals necessary for rebuilding early lesions. Casein phosphopeptide-amorphous

calcium phosphate (better known as Recaldent [Bonlac Foods Limited, Melbourne, Australia, [www.recaldent.com](http://www.recaldent.com)]) has been available in the United States as chewing gum (Trident White and Trident for Kids, Pfizer, Morris Plains, NJ, [www.pfizer.com](http://www.pfizer.com)) for the last few years. Most clinicians who practice caries management and have remineralization protocols include Recaldent in their patient recommendations. Recaldent has been incorporated into a prophylaxis paste called Tooth Mousse (GC Australia, Sydney, Australia, [www.gcasia.com](http://www.gcasia.com)). In October 2004, GC America plans to relaunch Tooth Mousse in the United States as Prospec MI Paste; this product with amorphous calcium and phosphorus

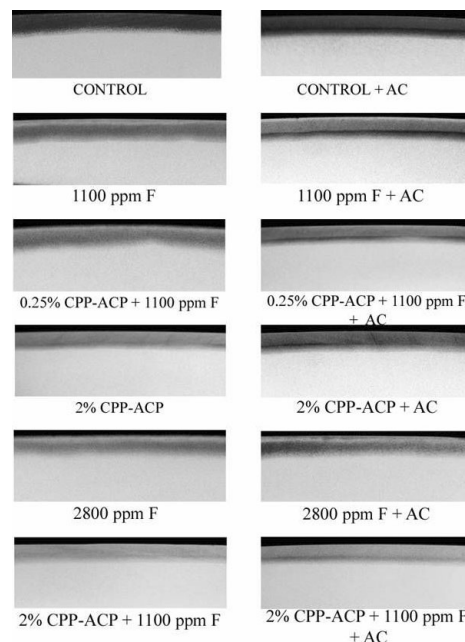


Figure 3—In vitro lesions healing with topical application of different concentrations of CPP-APP.

encased in casein has the potential to eliminate white spot infections chair-side, and it can be given to patients for home use (Figure 1).<sup>16, 17</sup>

Recaldent contains calcium and phosphorus shielded in a casein coating that is removed during an acid attack, filling the lesion completely, a feat that is not possible with fluoride at any level (Figures 2 and 3).<sup>4</sup> A remineralized lesion that is only treated with fluoride to harden the enamel will still have discoloration, but a lesion that is treated with Recaldent and fluoride has a better chance of achieving the natural translucency that the tooth had originally (E. Reynolds, oral communication, Aug 2001).

With all the controversy over fluoride and patients becoming more wary of ingesting a toothpaste that contains fluoride, it's good to know that dental hygienists can offer alternative toothpastes that are more than just abrasives mixed with a binding agent and flavor.

## Conclusion

MI dentistry is an empowerment tool for the dental hygiene department in any dental practice. Definitive treatment for caries can and should be part of the dental hygiene treatment plan. Although not limited to the occlusal surfaces of teeth, sealant materials are also part of the MI philosophy. While it's true that the decay process usually originates in the pits and fissures of the teeth, it also can begin on the broad surfaces of the tooth. **COH**

## Disclosure

The author received an honorarium from GC America Corporation to write this article.

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