## Perspectives

## DENTIN BONDING SYSTEM NOMENCLATURE: THE NEXT GENERATION

D ecause there are so many ma- $\mathbf{b}$ terials from which to choose, manufacturers market their products in a certain way to distinguish them from the competition. This is understandable, but it becomes confounding for practicing dentists. They are confused about what things are and how to label them. This is especially true of resin adhesives for bonding to dentin and enamel. When there were but a few types of bonding systems, it was simple to call them first- or secondgeneration bonding systems, but now there are so many generational claims, it is completely unwieldy for those describing them and hopelessly confusing for those trying to understand.

It is difficult to make clean definitions of generations. Burke and McCaughey offered an analysis of the four generations of dentin bonding in 1995.<sup>1</sup> The most common understanding is that fourthgeneration bonding systems include a phosphoric acid etchant and multiple bottles containing primers and separate bonding resins, and that one-bottle systems applied after etching with phosphoric acid are the fifth generation. The application of phosphoric acid simultaneously to both enamel and dentin became known as total etch.

This thinking made the very first systems, such as Kadon (LD Caulk Dentsply, York, PA) and Sevriton (Amalgamated Dental, Zurich, Switzerland), the first generation and materials such as the original Scotchbond (3M ESPE, St. Paul, MN, USA) the second generation. The systems that recommended alteration of the smear layer usually with some dilute acid fell into the third generation. To assuage our guilt in applying these dilute acids to dentin, they were referred to as "conditioners"; that way we could avoid feeling like we were etching dentin, when we were really etching dentin.

It is generally understood that the bonding systems called self-etching adhesives now comprise the sixth generation, and there is an effort under way to label as the seventh generation the self-etching bonding systems that are contained in a single bottle—the all-in-one systems.

But there are complications. The first fourth-generation material came into existence before the first third-generation material. Professor Takao Fusayama created the bonding system New Bond in 1977. New Bond (Kuraray Co. Ltd., Osaka, Japan) was a system that contained a phosphoric acid etching gel and phosphate ester–based, twobottle resin adhesive. The research article describing this was submitted for publication in 1977, but it languished for 2 years because it was not believed. It finally saw the light of print in 1979.<sup>2</sup>

Then we have another problem. The first self-etching system, which is supposed to be the sixth generation, arrived on the scene in 1993, before the fifth-generation systems. That material was Liner Bond 2 (Kuraray Co. Ltd.).<sup>3</sup>

It gets worse. Although we have referred to the dentin bonding systems that use phosphoric acid etchants as being the fourth and fifth generations, it must be remembered that phosphoric acid itself is self-etching. No resin sticks to dentin or enamel surfaces without the surface being acid treated in some fashion. The sixth- and seventh-generation dentin bonding systems acid treat the dentin and enamel, and they typically do so through the application of acidic monomers, some of which are



derived from phosphoric acid. Since these acidic monomers are applied to both dentin and enamel, this is also a total etch.

So what are we to do with all this confusion? It is proposed that we do away with all "generations" of dentin bonding and create a new classification system for the purposes of clarity. The terms total etch and self-etch are tempting, but they are inadequate since phosphoric acid is self-etching and "self-etch" systems are total etch since they are applied to both enamel and dentin. When using the so-called total-etch systems, the etchant gel is rinsed from the surface with an air-water spray. The so-called self-etch system conditioners are not rinsed from the tooth. Therefore, there are two kinds of

resin adhesive systems: rinse-etch systems and no-rinse systems. There may be subcategories within each of the two types; that is, there could be one-, two-, or three-part (or bottle) systems that are rinseetch, or there might two-bottle systems that are no-rinse systems. All-Bond 2 (Bisco Inc., Schaumburg, IL, USA) would be classified as a four-bottle, rinse-etch system, and Clearfil SE Bond (Kuraray Co. Ltd.) would classified as a two-bottle, no-rinse system. Optibond FL would be classified as a two-part or twobottle, rinse-etch system, and Xeno IV would be a single-bottle, no-rinse system. This nomenclature would be of great value in the discussion of adhesives and make clear right away the kind of system being described. It would also save us from the hyperbole of overly zealous marketing. Just think of this as the second generation of dentin bonding nomenclature.

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## REFERENCES

- Burke FJT, McCaughey D. The four generations of dentin bonding. Am J Dent 1995; 8:88–92.
- Fusayama T, Nakamura M, Kurosaki N, Iwaku M. Non-pressure adhesion of a new adhesive restorative resin. J Dent Res 1979; 58:1364–1370.
- Barkmeier WW, Los SA, Triolo PT Jr. Bond strengths and SEM evaluation of Clearfil Liner Bond 2. Am J Dent 1995; 8:289–293.

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