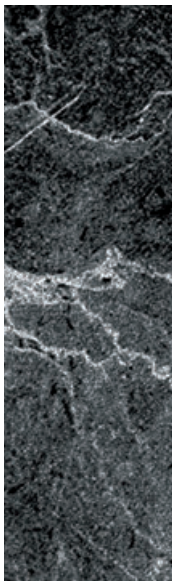

Ask the Experts

ADHESIVES AND FOUNDATIONS

Associate Editor
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QUESTION: I have been told that certain adhesives should not be used with self-cure and dual-cure composite core materials. Can you clarify this issue for me?

ANSWER: Dr. Franklin Tay, who has done much of the research in this area, addressed this same question in a *JERD* "Ask the Experts" piece in 2001 (*J Esthet Restor Dent* 13:48–9). However, because many new adhesives have become available since that original piece and there is still much confusion about adhesive-composite compatibility issues, the timing is good for an update.

Four distinct categories of resin-based enamel/dentin adhesives are currently available:

1. three-step total-etch systems
2. two-step total-etch systems that combine priming and bonding steps, commonly called "one-bottle" systems
3. self-etch primers with a separate bonding resin
4. all-in-one adhesives that use a single solution to etch, prime, and bond

Incompatibility of self-cure or dual-cure composites is *not* an issue for all four categories. Rather, it is an issue for only two of them—the one-bottle systems and the all-in-one adhesives. Stated differently, self-cure and dual-cure composites *are* compatible with adhesive systems that include a separate light-cured bonding agent (ie, the final step of a three-step total-etch system or two-step self-etch primer system).

The incompatibility between adhesive and composite arises from two sources, both of them related either directly or indirectly to the acidity of the adhesive system. Most one-bottle primer/adhesive systems are relatively acidic, and of course, the all-in-one adhesives are even more so. When applied and light activated on the tooth surface, the outermost layer—including acidic resin monomers—remains uncured as a result of oxygen inhibition. When a self- or dual-cure composite is applied to this surface, the tertiary amine component of its initiator system can react with the acidic monomers, resulting in incomplete polymerization of the composite. Incomplete polymerization leads to the weakening of the interfacial bond.

Making the problem even worse is the fact that the adhesive behaves as a semi-permeable membrane that allows water to diffuse from the hydrated dentin into the adhesive–composite interface. Thus, permeability of the

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adhesive is the second factor contributing to the incompatibility with self-cure composites, as those materials set slowly, allowing greater diffusion than would occur with a light-activated composite.

Having explained the theory of adhesive-composite incompatibility, the more important question is how can this be avoided clinically? Manufacturers of some total-etch one-bottle adhesives (eg, Prime & Bond NT, Dentsply Caulk, Milford, DE, USA, and OptiBond Solo Plus, Kerr, Orange, CA, USA) provide special catalysts that can be mixed with the adhesives to improve bond strengths. Research on these catalysts suggests that they can improve the bond strengths of self-cure composites, but not to the level attained by light-cured composites. A similar catalyst is now available for at least one all-in-one system (Xeno IV, Dentsply Caulk).

A very simple alternative for preventing incompatibility issues is to avoid the use of simplified adhesives with self-cure and dual-cure composites. In other words, use an adhesive system that has a light-cured bonding agent as its final step—either a three-step total-etch system or a two-step self-etch primer system. For practitioners who use only a one-bottle or all-in-one adhesive, the adhesive can be covered with a resin bonding agent from a three-step system such as Scotchbond Multi-Purpose (3M ESPE, St. Paul, MN, USA) or an unfilled resin specifically designed for this purpose (BondLink, Den-Mat Corporation, Santa Maria, CA, USA).

SUGGESTED READING

Tay FR, Pashley DH, Yiu CKY, et al. Factors contributing to the incompatibility between simplified-step adhesives and chemically-cured or dual-cured composites. Part I. Single-step self-etching adhesive. J Adhes Dent 2003;5:27–40.

Tay FR, Suh BI, Pashley DH, et al. Factors contributing to the incompatibility between simplified-step adhesives and self-cured or dual-cured composites. Part II. Single-bottle total-etch adhesive. J Adhes Dent 2003;5:91–105.

Suh BI, Feng L, Pashley DH, Tay FR. Factors contributing to the incompatibility between simplified-step adhesives and chemically-cured or dual-cured composites. Part III. Effect of acidic resin monomers. J Adhes Dent 2003;5: 267–82.

Cheong C, King NM, Pashley DH, et al. Incompatibility of self-etch adhesives with chemical/dual-cured composites: two-step vs one-step systems. Oper Dent 2003;28:747–55.

Editor's Note: If you have a question on any aspect of esthetic dentistry, please direct it to the Associate Editor, Dr. Edward J. Swift Jr. We will forward questions to appropriate experts and print the answers in this regular feature.

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