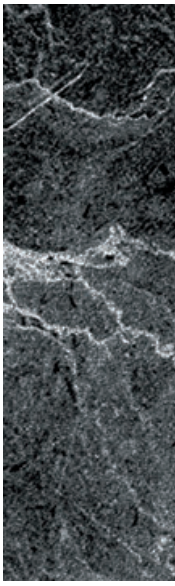

Ask the Experts

DENTIN BONDING

Guest Expert
David H. Pashley, DMD, PhD*

Associate Editor
Edward J. Swift Jr., DMD, MS

QUESTION: In using an "etch-and-rinse" adhesive system, if I dry the preparation to check the enamel etch, what is the best way to rewet the dentin?

ANSWER: Over the past 6 years, we developed what we call the macro-model of the hybrid layer (see Pashley and colleagues[1]). Rather than being 5- to 10-μm thick as it is in etch-and-rinse adhesive, we make it 200-μm thick. We then completely demineralize these disks in 37% phosphoric acid over a 4-hour period, creating a completely demineralized "macro-hybrid layer." This is glued down to the bottom of a well under a device that can follow changes in the height of the matrix during drying and after rewetting with water, or 2-hydroxyethyl methacrylate (HEMA), or HEMA–water primers, etc.

When we air-dried our 200-μm-thick specimens, they shrank to about 100 μm. The maximum rate of expansion by water was 1.4 μm/second. Thus, it required 69 seconds to expand 100 μm. Clinically, a 10-μm-thick demineralized layer should shrink about 5 μm before the collagen fibrils collapse upon themselves and cannot shrink anymore. Thus, a full 5-μm expansion should take only 4 seconds in water.

Can aqueous solutions of HEMA solutions provide a similar rate of reexpansion? If one places pure 100% HEMA on dried, collapsed dentin, there is no expansion whatsoever. We have tested five experimental HEMA-based primers: 100% HEMA/0% water, 90% HEMA/10% water, 75% HEMA/25% water, 50% HEMA/50% water, and 100% water. Random application of these solutions to air-dried acid-etched dentin produced zero expansion by 100% HEMA, 19% expansion by the 90% HEMA solution, 33% expansion by the 75% HEMA solution, 59% expansion by the 50% solution, and 100% expansion by 100% water. Clearly, the degree of expansion (and its rate) is proportional to water concentration, not HEMA concentration.

In the experiment shown in Fig. 3C of our review,[1] as the water concentration increased from 0 to 10%, the matrix slowly expanded to 18.7% of its full potential. When we kept increasing

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the water concentration, which requires decreasing the HEMA concentration, the matrix expanded faster and more. However, even at 50% water/50% HEMA, the rate of expansion was not as high as that of water alone, and the expansion was only 58.9% of what water can do.

Thus, all experimental rewetting agents slowed expansion because they contain less water than does pure water. Most rewetting solutions available commercially (e.g., Aqua-Prep F, BISCO, Schaumburg, IL, USA; Gluma Desensitizer, Heraeus Kulzer, Armonk, NY, USA) are 65% water/35% HEMA.

We recommend that acid-etched dentin not be air-dried, but if it is, that it be reexpanded with water.

REFERENCES

1. Pashley DH, Tay FR, Carvalho RM, et al. From dry bonding to water-wet bonding to ethanol-wet bonding. A review of the interactions between dentin matrix and solvated resins using a macromodel of the hybrid layer. Am J Dent 2007;20:7–21.

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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