

# Laboratory and Clinical Evaluation of a Self-Etching Primer

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**R**evolutionary advances in adhesive chemistry are changing the process of orthodontic bonding. Prompt L-Pop,\* a self-etching primer that combines etchant and primer in one chemical compound, was the first sixth-generation adhesive to be released to the dental market. The same chemistry is employed in the new Transbond Plus Self-Etching Primer,\*\* an identical product marketed specifically for orthodontics.

Although fifth-generation adhesives al-

lowed clinicians to bond in a moist environment, they still required etching with phosphoric acid to achieve the bond strength necessary for orthodontic applications.<sup>1</sup> Bond failures can occur if the etchant is left on too long, which yields weak enamel rods, or if it is not rinsed properly, which reduces the bond strength. The sixth-generation primers provide comparable bond strengths (Fig. 1) without the time-consuming process of applying and rinsing the etchant. Fewer steps in the bonding process mean fewer human errors.

The chemistry of Transbond Plus Self-Etching Primer is similar to that of phosphoric acid, with two primer chains that form a solid

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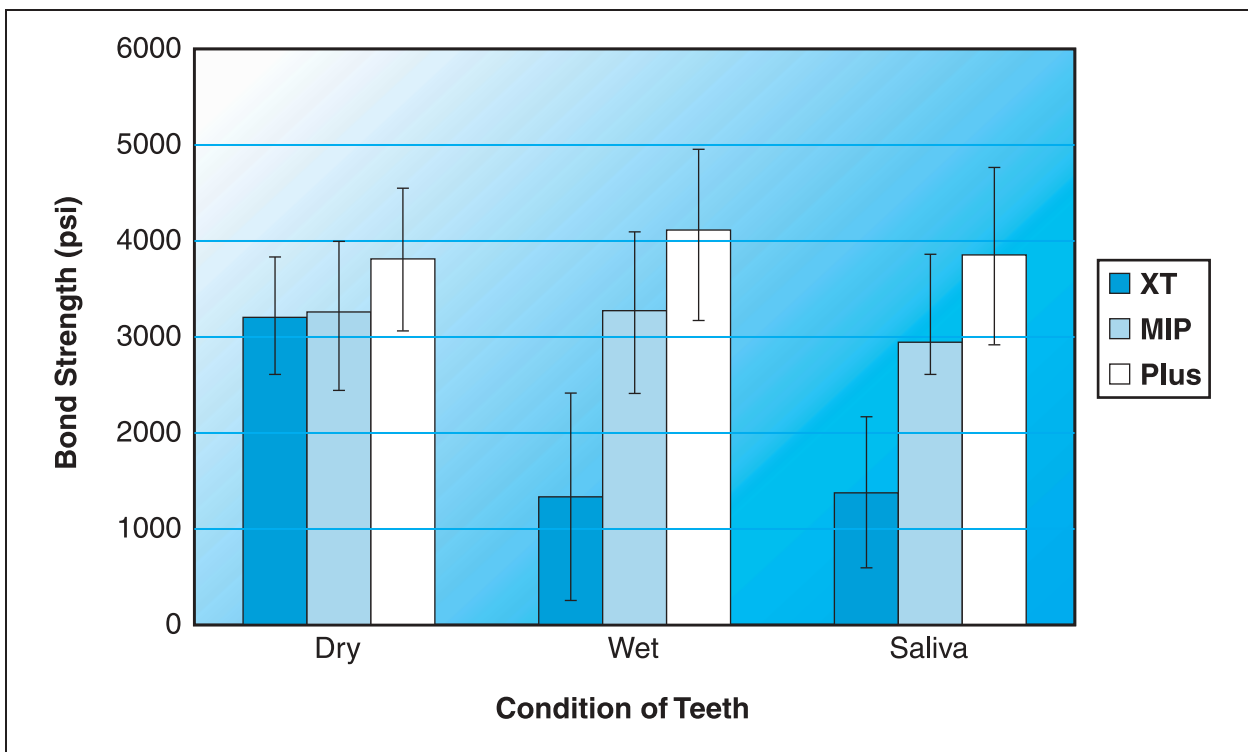
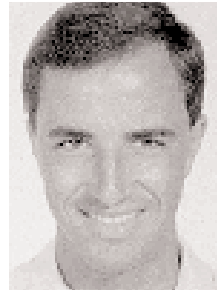


Fig. 1 In vitro comparison of bond strengths between Transbond XT, Transbond MIP, and Transbond Plus Self-Etching Primer in dry, wet, and saliva-contaminated fields (from testing by 3M Unitek).



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primer matrix upon curing (Fig. 2). The liquid begins to etch the enamel as soon as it is applied, but it changes to a primer once the two hydroxide chains are converted and hydrogen is released. Since no etchant remains on the enamel, there is no need for rinsing.

Because the monomers that cause the etching are also responsible for bonding, the depth of penetration of the monomers to be polymerized is exactly the same as the depth of demineralization, resulting in a complete hybrid layer. Sixth-generation adhesives were originally developed to adhere to dentin and reduce post-treatment sensitivity; since orthodontic bonding surfaces are only enamel, however, the etch patterns are consistently similar to those produced by etching with phosphoric acid.<sup>2</sup>

### Bonding Procedure

The unit-dose setup of Transbond Plus is designed for bonding an entire dental arch (Fig. 3), although some orthodontists are using one package for both arches. After the teeth are pumiced as usual (Fig. 4), the Transbond Plus is gently swirled onto each enamel surface for two to five seconds<sup>3</sup> with the microbrush contained in the package (Fig. 5). As the pH rises, the etchant

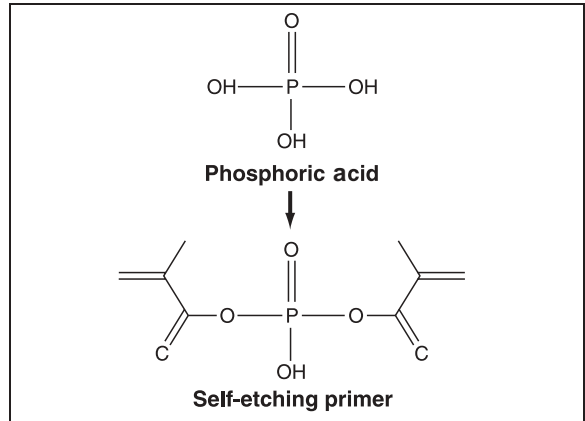


Fig. 2 Chemical comparison of phosphoric acid to self-etching primer.



Fig. 3 Unit-dose bonding setup with Transbond Plus and APC\*\* (adhesive-precoated) brackets.



Fig. 4 Teeth pumiced as usual.



Fig. 5 Transbond Plus swirled onto enamel surface for two to five seconds.



Fig. 6 Primer thinned with air burst.



Fig. 7 APC brackets placed.



Fig. 8 Excess adhesive removed from around brackets with scaler.

converts to the primer matrix.

The primer is then thinned with a burst of air (Fig. 6), adhesive-coated brackets are placed (Fig. 7), and any excess adhesive is removed



Fig. 9 Bracket cured interproximally for 10 seconds.

with a scaler (Fig. 8). After each bracket is light-cured interproximally for 10 seconds (Fig. 9), the archwire can be tied in immediately (Fig. 10).

Fifth-generation primers vary in viscosity and generally thicken when exposed to air. Because the sixth-generation primers remain in their unit-dose packages, there is less evaporation and thus a more stable viscosity and wetting capability. I have had no problems using Transbond Plus for bonding any orthodontic attachment to either a normal enamel surface or to microetched mottled enamel, gold, or amalgam. The product also works well in difficult wet fields, such as when bonding impacted canines or second molars, fixed retainers, or palatal expanders, and in indirect bonding.

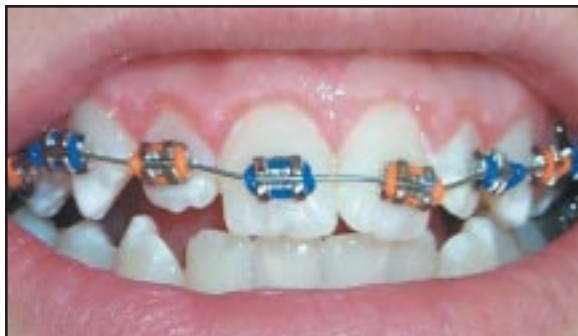
### Clinical Study

Four different combinations of brackets and primers, as shown below, were tested in two offices by two orthodontists:

Brackets	Primer
1. Mini-Twin** .018"	Transbond MIP**
2. Mini-Twin .018"	Prompt L-Pop
3. Victory Series** APC	Transbond MIP
4. Victory Series APC	Prompt L-Pop

Transbond XT\*\* was the adhesive used in all cases. The Victory Series brackets had offset

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**Fig. 10 Archwire tied in immediately.**

bases on the premolars.

Bond failure rates were recorded for six months. The Adhesive Remnant Index was not evaluated in this study.

Although the self-etching primer did not appear to produce a statistically significant reduction in bond failures (Table 1), it is noteworthy that there were no failures at all in Group 4. I attribute this success rate not only to the better adaptation of the bracket base and mesh surface area compared to the Mini-Twin brackets, but also to the reduction of steps in the bonding procedure.

### Conclusion

No new adhesive system has created so much interest and been so well received by clinical staff in orthodontics since the introduction of no-mix, light-cured adhesives in the early 1980s. Considering that the cost of one bond failure is

**TABLE 1  
CLINICAL STUDY**

	No. Bonded	No. Successful	Pct.
Group 1	174	171	98.3
Group 2	284	282	99.3
Group 3	290	288	99.3
Group 4	230	230	100.0
Groups 1 + 3	464	459	98.9
Groups 2 + 4	514	512	99.6

No significant differences ( $p < .05$ ) were found between Groups 1 and 2 (Mini-Twin brackets with different primers), 3 and 4 (Victory Series brackets with different primers), 1 and 3 (Transbond MIP with different brackets), 2 and 4 (Prompt L-Pop with different brackets), or 1 + 3 and 2 + 4 (combined brackets with different primers).

about \$100, the savings from eliminating only one failure more than offsets the added cost of this product. Adding to that the reduced expense of applicators, lack of waste, and time saved in bonding, I predict that conventional etchants will be completely outmoded in orthodontics within five years.

### REFERENCES

1. Improved efficiency in orthodontic bonding, *Orthod. Persp.*, Fall 1998.
2. Garcia-Godoy, F.: Bond strength of Prompt L-Pop to enamel and dentin, report to ESPE, University of Texas Health Science Center, San Antonio.
3. Hansen, J.: Application technique of a new self-etching primer, in vitro study conducted by 3M Unitek, Monrovia, CA.