3M™ Scotchbond™ Universal Adhesive is worthy of its name.

Sometimes less is actually more. While it might seem counterintuitive, universal adhesives offer a wide range of application uses in one bottle. Their multimode capability gives dentists the flexibility to use the etch mode of their choice, without having to stock a large assortment of products for different restoration procedures.

Dentistry is a complex marriage of art and science. The integrity of adhesive bonds directly affects the success of dental restorations. Universal adhesives give dentists the option of using one adhesive for direct, indirect, posterior and anterior restorations in the etch mode of their choice. The result is a streamlined procedure, a slimmed-down inventory and a simplified process involving fewer steps for dentists and their staff to master.

The evolution of dental adhesives favors simplicity.

Dental adhesives are the most successful when they are the least noticeable. Patients whose restorations stay in place and who never experience postoperative sensitivity likely never give the adhesive their dentist used a single thought, much less a second one.

Dentists have more adhesives to choose from than ever before. Earlier-generation dental adhesives are still used by many dentists. Some are satisfied with their current adhesive systems, while others want more clinical data on the latest category, universal adhesives.

Introduced in the 1990s, fourth-generation dental adhesives are considered by some to be the gold standard. These multibottle, total-etch adhesives use an etchant on both enamel and dentin and require etching, rinsing, priming and bonding. While the clinical study history is undeniably longer for fourth-generation adhesives, dentists who found the number of bottles and steps to be cumbersome began requesting a simplified adhesive system.[1]

A move toward reducing steps spurred the development of fifth-generation, total-etch dental adhesives, which combine primer and adhesive in one bottle. However, restoration retention rates for this class are lower compared to fourth-generation adhesives.[2] Sixth- and seventh-generation adhesives are self-etch systems that use acidic monomers rather than phosphoric acid to etch.

Universal adhesives are the latest class in the evolution of dental adhesives. These one-bottle systems can be used in total-, self- or selective-etch modes on a wide range of dental materials.

Applying fourth-generation, total-etch adhesives involves the following steps:[2]

1. Apply etchant for 15 seconds
   - Rinse
   - Blot or air dry
2. Apply primer
   - Air dry
3. Apply adhesive
   - Light cure for 10 seconds

The process for applying 3M™ Scotchbond™ Universal Adhesive is more streamlined:

1. Apply adhesive and scrub for **20 seconds**
2. Dry for **five seconds** using a gentle air stream to evaporate the solvent
3. Light cure for **10 seconds**

A standout adhesive: 3M™ Scotchbond™ Universal Adhesive offers freedom and flexibility.

Scotchbond Universal Adhesive gives dentists the freedom to be flexible as they have the option to bond both indirect and direct restorations and to use their preferred etch technique. Scotchbond Universal Adhesive bonds to a wide range of dental materials — including enamel, dentin, glass ceramic, zirconia, noble and nonprecious alloys, and composites — without a separate primer. And with its moisture tolerance and ability to bond to moist or dry teeth, it is also less technique sensitive.

While bond strength and integrity are the most important features of Scotchbond Universal Adhesive, it also provides other benefits that make it a convenient choice in a dentist's day-to-day practice. The adhesive offers convenience in both a one-hand operable flip-cap bottle and a sealed unit-dose delivery system. Having one product for multiple applications means less inventory taking up office space and less chance of waste with adhesives that might expire before they are used. Scotchbond Universal Adhesive also requires no refrigeration and can be left at room temperature for up to two years. Once opened, its water- and ethanol-based solvent isn't prone to evaporation as fast as other types of solvents, which prevents thickening of the adhesive.

3M™ Scotchbond™ Universal Adhesive is built on a compelling chemistry.

To develop Scotchbond Universal Adhesive, 3M built upon the strong performance of its existing adhesives. One example is the inclusion of 3M's Vitrebond™ Copolymer, a proprietary polyalkenoic acid copolymer that is a key ingredient in some of 3M's legacy bonding agents. Vitrebond Copolymer fosters moisture tolerance, enables Scotchbond Universal Adhesive to bond with moist or dry dentin, and reduces postoperative sensitivity and technique sensitivity. Scotchbond Universal Adhesive's water- and ethanol-based solvent system also minimizes postoperative sensitivity.

Two other distinguishing features of Scotchbond Universal Adhesive are the monomer MDP (methacryloxydecyl phosphate) and silane. MDP improves bonding to enamel, adhesion to metal and nonglass ceramic substrates, and overall product stability. Silane enables bonding to glass ceramic surfaces. Because Scotchbond Universal Adhesive contains silane, there is no need to add a silane primer, which is another efficiency.

Scotchbond Universal Adhesive is also designed to tolerate mild to moderate saliva contamination. A study found that the bond strength on dentin specimens of Scotchbond Universal Adhesive and another self-etch adhesive were not affected by high humidity and saliva contamination.[3]

Some of Scotchbond Universal Adhesive's indications:[4]

- All classes of fillings (according to the G.V. Black system for caries classification) with composite or compomer
- Root surface desensitization
- Sealing of cavities prior to cementation of amalgam restorations
- Sealing of cavities and preparations of tooth stumps prior to temporary cementation of indirect restorations
- Protective varnish for glass ionomer fillings
- Bonding of pit and fissure sealants
- Intraoral repair of existing composite, porcelain fused to metal, and all ceramic restorations without extra primer
- Bonding of dual-cure and chemical-cure cements, core buildup materials and composites (with activator)
- Bonding of core buildups made of composite or core buildup materials
- Repair of composite or compomer fillings
- Cementation of veneers when combined with 3M™ RelyX™ Veneer Cement
- Cementation of indirect restorations (crowns, inlays) of composite or compomer, ceramic and metal when combined with 3M™ RelyX™ Ultimate Cement

Please refer to the Instructions for Use for more information.

Dr. Christoph Thalacker, a senior specialist with 3M Oral Care and one of the researchers who developed 3M™ Scotchbond™ Universal Adhesive, noted that the adhesive was designed to transition from a hydrophilic state to a hydrophobic state. Its high degree of conversion allows dentists to wet hard dental tissue before curing, which reduces the odds of staining, water uptake and hydrolysis.

With its ability to bond to dentin, Scotchbond Universal Adhesive can be applied to seal exposed dentin tubules, thereby reducing existing sensitivity in patients.[4]

Unique 3M chemistry powered by VMS technology:

Vitrebond™ Copolymer

- Methacrylate-modified polyalkenoic acid copolymer
- Provides more consistent bond performance to dentin under varying moisture levels

MDP monomer

- Monomer that provides the self-etching properties
- Higher enamel bond strength
- Bond strength to zirconia, alumina, metals
- Higher hydrolytic stability — no refrigeration needed

Silane

- Allows for chemical bonding to glass ceramic surfaces without using a separate ceramic primer

What do dentists need in an adhesive?

Dentists want an adhesive that bonds for the long haul. More precisely, they want an adhesive that gives their patient a reliable, secure restoration virtually guaranteed not to cause postoperative sensitivity. Dentists are motivated to keep their patients free of postoperative sensitivity because they care about their comfort and want to reduce the likelihood of repeat visits to repair restorations whose bonds failed — chair time that might not be billable.

Clinical studies matter to Dr. Robert Margeas, D.D.S., who uses 3M™ Scotchbond™ Universal Adhesive for direct restorations in his cosmetic and restorative dentistry practice in Des Moines, Iowa. But he also pays particular attention to rates of sensitivity and restoration failure within his own practice.

"I think clinical studies are important, but anecdotally in my office is even more important," said Margeas, who is also a faculty member at the University of Iowa College of Dentistry. "But if I were to see staining, or I would see restorations falling off, or I would see sensitivity, I would be more inclined to say, 'You know what? I don't care what they say. It doesn't work in my hands.'"

Dentists have multiple options in a market increasingly flush with adhesives. However, universal adhesives are not identical in their chemistry nor in their clinical history, making it necessary to consider the data of each adhesive when deciding whether to switch adhesives or try a new product. Many dentists rely not only on their own experiences, but also on published studies before making a decision to try a new adhesive.

A review of the literature convinced Dr. Marcos Vargas, D.D.S., to try Scotchbond Universal Adhesive in both direct and indirect restorations.

"I started using them because usually I like to look at the literature, and I like to be evidence-based in my practice, what I do with my patients. And even though the total-etch three-step [adhesives] are still the gold standard, I think there are a lot of benefits to using universal adhesives," said Vargas, who has been in practice for more than 30 years and is on faculty at the University of Iowa College of Dentistry.

Vargas uses the selective-etch option because he always etches enamel, and he particularly appreciates being able to learn one set of steps expertly.

> **"I wanted to have one adhesive that works with both [direct and indirect restorations] and with which I was comfortable and used daily. Instead of changing instructions every time, I want to have one set of instructions that I use properly."**
>
> **— Dr. Marcos Vargas, D.D.S.**

All clinicians have received honorariums from 3M Oral Care.

Studies highlight performance and benefits of 3M™ Scotchbond™ Universal Adhesive.

Because Scotchbond Universal Adhesive was introduced in 2011, it has a documented clinical history.

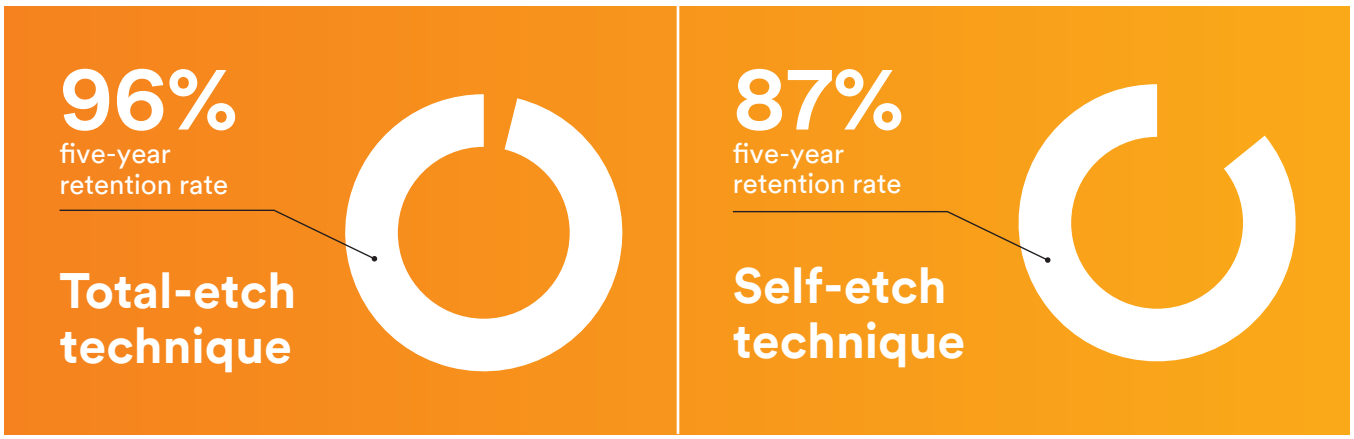
That deeper history was highlighted in a five-year clinical study presented in March 2018, which found that Scotchbond Universal Adhesive performed as well as or better than a 3M legacy product with a long, favorable clinical history.[5] In the study, researchers at the University of Alabama at Birmingham compared the bond strength of 3M™ Adper™ Scotchbond™ Multi-Purpose Plus Adhesive in total-etch mode to Scotchbond Universal Adhesive in both the total-etch and self-etch modes. The study analyzed direct restorations to noncarious cervical lesions at baseline, six, 12, 24, 36 and 60 months.

The restorations bonded with Scotchbond Universal Adhesive had higher five-year retention rates in both total-etch and self-etch than did those bonded with Adper Scotchbond Multi-Purpose Plus Adhesive. Scotchbond Universal Adhesive had:

- A 96 percent five-year retention rate with the total-etch technique
- An 87 percent five-year retention rate with the self-etch technique

The study found that Adper Scotchbond Multi-Purpose Plus Adhesive had a 74 percent retention rate at five years.

"[Multi-Purpose] has been in the market for more than 25 years with excellent clinical results," said Thalacker, explaining that the study confirmed 3M's position that its universal adhesive would perform as well as or better than its own legacy product.



3M™ Scotchbond™ Universal Adhesive outperforms a fourth-generation adhesive.

In another study[6] presented in 2017, composite restorations using Scotchbond Universal Adhesive performed better than those using the control, a fourth-generation, two-bottle, total-etch adhesive, OptiBond™ FL. Scotchbond Universal Adhesive was applied to noncarious lesions using etch-and-rinse with phosphoric acid, self-etch and selective-enamel-etch, while OptiBond FL was applied in etch-and-rinse mode. The adhesives were assessed at the time of placement and at regular intervals up to 12 months, both clinically and by optical coherence tomography (OCT).

The study found that:

- Failure rates were lower for all three etch modes using Scotchbond Universal Adhesive than for the etch-and-rinse OptiBond FL
- Defects at the dentin/cement-composite interface were lower in all applications of Scotchbond Universal Adhesive than for OptiBond FL

To etch or not to etch? A study shows 3M™ Scotchbond™ Universal Adhesive bonds similarly in all modes.

No statistical difference was revealed among four etching options in a 36-month, double-blind, randomized clinical trial.[7] In that study, 200 restorations were analyzed in 39 patients.

In the study, researchers:

- Bonded the restorations using one of four methods: etch-and-rinse plus moist dentin, etch-and-rinse plus dry dentin, selective-enamel etch, or self-etch
- Evaluated the composite restorations at baseline, six, 18 and 36 months
- Noted that the adhesive performed just as well with dry dentin as with moist, a finding the authors termed "surprising" given the assumption that moist dentin is necessary for reliable bonding to dentin

Prepare the cavity using your preferred etching technique.

Total-etch
Phosphoric acid is applied to both the enamel and dentin surfaces.

Selective-etch
Phosphoric acid is applied only to the enamel surface. Dentin treatment is achieved through the self-etch function of Scotchbond Universal Adhesive.

Self-etch
Dentin treatment is achieved through the self-etch function of Scotchbond Universal adhesive.

3M™ Scotchbond™ Universal Adhesive was designed to avoid postoperative sensitivity.

Two studies demonstrate that virtually no postoperative sensitivity is associated with Scotchbond Universal Adhesive.

A 2012 3M noninterventional study[8] investigated the occurrence of initial postoperative sensitivities for the adhesive applied in total-etch, self-etch and selective-etch modes. The 120 participating dentists were asked which mode they used, how many cases they performed and whether any postoperative sensitivity occurred.

The study found:

- Fourteen cases of sensitivity out of 3,467 total-etch procedures, or 0.4 percent
- Two cases of sensitivity out of 3,495 self-etch procedures, or 0.06 percent
- No cases of sensitivity out of 1,544 selective-etch procedures, or 0 percent

No cases of postoperative sensitivity were reported in a U.K. practice-based assessment of restorations using Scotchbond Universal Adhesive and both total-etch and self-etch modes. Thirty-six of the 64 restorations were reviewed three years later — 18 in total-etch and 18 in self-etch.[9]

Total-etch
Sensitivity occurred in 0.4 percent of cases

Self-etch
Sensitivity occurred in 0.06 percent of cases

Selective-etch
Sensitivity occurred in 0 percent of cases

3M™ Scotchbond™ Universal Adhesive would be a valuable addition for any dental practice.

When deciding whether to add a universal adhesive to their practices, dentists should review the clinical histories and evaluations of each product they are considering. In the case of Scotchbond Universal Adhesive, evaluations and studies show that it would be a reliable addition to any dental practice.

Learn more about universal adhesives in "Adhesives: What Makes Them Work," a webinar from the 3M℠ Health Care Academy featuring Dr. John Burgess, D.D.S., of the University of Alabama at Birmingham.

Learn more about Scotchbond Universal Adhesive at 3M.com/Scotchbond or contact your 3M sales representative.

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