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Incompatibility Profiles of All-in-one Adhesives. III. Ternary Catalyst and Resin-Coating

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Objectives: Although ternary catalysts such as the salts of aryl sulphinate, barbituric acid and aryl borate are effective in eliminating true incompatibility between ionic adhesive monomers and auto-cured composites, they do not contribute to reducing the permeability of all-in-one adhesives. This study compared the use of an add-on ternary catalyst with the use of a light-cured resin-coating on the coupling of an auto-cured composite to dentin bonded with four all-in-one adhesives.

Methods: A 1.8% solution of the sodium salt of p-toluene sulphinate was used with the respective all-in-one adhesive, Xeno III (XE, Caulk-Dentsply), Adper Prompt (AP, 3M ESPE), One-Up Bond F (OU, Tokuyama) and iBond ((IB, Heraeus-Kulzer), and applied to either hydrated dentin (HB) or dehydrated dentin (DB). The same adhesives were applied as a control to hydrated dentin without the ternary catalyst (H), or with an additional coat of D/E resin (Bisco; HR). The bonded teeth were coupled to an auto-cured composite (Bisfil 2B, Bisco). Microtensile bond strength and TEM were evaluated.

Results: Microtensile bond strengths ($X \pm SD$, $n=20$ in MPa; Kruskal-Wallis/Dunn's). For each column, different superscripts indicated significance difference at $P<0.05$.

	XE	IB	OU	AP
H	11.9 \pm 4.8 ^b	7.3 \pm 4.0 ^b	5.5 \pm 2.1 ^b	0.0 \pm 0.0 ^b
HB	12.4 \pm 4.8 ^b	8.7 \pm 2.7 ^b	13.6 \pm 4.5 ^b	0.0 \pm 0.0 ^b
DB	51.3 \pm 7.4 ^a	26.8 \pm 6.6 ^a	27.5 \pm 9.2 ^{ab}	35.7 \pm 6.0 ^a
HR	50.2 \pm 9.9 ^a	32.0 \pm 7.8 ^a	46.85 \pm 5.8 ^a	46.5 \pm 8.8 ^a

TEM revealed that when a ternary catalyst was used, effective coupling only occurred when bonding was performed on dehydrated dentin. Conversely, neither water blisters nor decoupling occurred when an adjunctive resin-coating was used on hydrated dentin.

Conclusions: The beneficial effect of incorporating or using add-on dual-cured catalysts in all-in-one adhesives is masked by the intrinsic permeability of these adhesives. Conversely, the use of an additional light-cured resin-coating, which invariably involves an extra bonding step, converts these adhesives to 2-step self-etch adhesives, and is effective in eliminating both true and apparent incompatibility with auto-cured composites.

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