



## Chemistry and Recent Developments of Universal Adhesives

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The ability to bond to tooth structure is the foundation of modern restorative dentistry. This presentation highlights the evolution of dental adhesives from an industry perspective, starting from the beginnings around 1950, leading to the clinically proven total etch adhesives of the 1990s and the trend toward self-etch formulations in the 2000s.

The introduction of modern universal adhesives represents a major development of the 2010s. These adhesives can be used in all etching modes, bond to the tooth and restoration materials, and can be used for direct and indirect indications.

Foundation for these developments was a deeper understanding of the mechanisms of adhesion to the tooth structure, and to restoration materials. Typically, the performance of an adhesive does not depend on the use of a single ingredient, but on an overall balanced and optimized formulation that contains various components with different roles, such as functional adhesive monomers and more.

While a wealth of literature exists on “Gold Standard” adhesives that have a long and successful clinical history, some universal adhesives have also accumulated vast scientific evidence while offering benefits like ease of use, low technique sensitivity, and versatility.

To achieve reliable results with a modern adhesive, several tips should be kept in mind regardless of the product, which result in a homogeneous adhesive layer, proper cure and ultimately high bond strength.

Finally, we will look at new trends in dentistry such as minimally invasive techniques and how recent adhesive developments may contribute.

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### <Curriculum Vitae>

1978	Research Triangle Institute Summer Intern
1979 – 1983	Northwestern University Graduate Research Assistant
1983 – 1987	3M Senior Research Chemist, Dental Products Division
1987 – 1991	3M Company, Research Specialist, Dental Products Division
1996 – 1998	Michigan State University, Adjunct Professor, Dept. of Chemical Engineering
1991 – 1999	3M Company, Senior Research Specialist, Dental Products Division
1997 – 2002	3M Corporate Curing Resource Center Co-founder
1999 – 2001	Chairman Executive Committee: NSF IUCRC “Fundamentals & Applications of Photopolymerization”
1999 – present	3M Corporate Fundraiser, Liaison NSF IUCRC “Fundamentals & Applications of Photopolymerization”
2005 – 2007	External Scientific Program Advisory Committee NIDCR University of Colorado School of Dentistry
1999 – 2008	3M Company, Division Scientist, 3M ESPE Dental Products Division/Curing Resource Center
2001 – 2009	3M Resin Modified Glass Ionomer Technology Platform Leader
2008 – present	3M, Corporate Scientist, 3M Oral Care Solutions Division
2010 – 2018	Industrial Director for the Minnesota Dental Research Center for Biomaterials and Biomechanics
2019 – present	External Advisory Committee for the Minnesota Craniofacial Research Training Program
2020 – present	AADR Board of Directors