

# The Science of Bonding

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William Channing famously said, “No power in society, no hardship in your condition can depress you, keep you down, in knowledge, power, influence, but by your own consent.” Dr. Neimar Sartori’s life is a testament to overcoming hardships and achieving success in spite of adversity. He was born in the small Brazilian city of São José de Cedro, near the Argentinian border, and at the age of two he moved with his family to the forests of the Amazon. Living without the comforts of electricity or running water in the middle of the forest, and without any formal education, Dr. Sartori learned to live off the land at an early age. Coming from a family of farmers, it was quite unprecedented and yet highly appreciated when Dr. Sartori showed an inclination towards the health sciences. His parents wanted him to get a higher education and he entered school formally at the age of nine when his family moved back to the city.

As a child, Dr. Sartori spent hours developing his hand skills through drawing and helping his mother with tailoring. He always enjoyed the practical aspects of kinaesthetic learning. His life away from regular civilization with poor access to healthcare made him appreciate the importance of accessible healthcare for all. With his desire to be involved in the field of healthcare and his excellent hand skills, it was not surprising that he decided to make dentistry his profession.

During his years as a dental student in Brazil, he was interested in both the

clinical aspects and the potential of research to developing biomaterials for dentistry. Dr. Sartori thoroughly enjoyed his five years at dental school learning the art of dentistry. However, he always felt his knowledge was lacking, with emphasis only on theoretical and practical dentistry. To further improve his knowledge in the field of research, he spent six years studying biomaterial science and its application in the field of dentistry.

Bonding has been a recurring theme of many of Dr. Sartori’s research papers. His thesis, presented for the completion of his MS degree in Restorative Sciences, was titled “Clinical effectiveness of a potassium oxalate-based desensitizing agent used in association with two single-bottle etch-and-rinse adhesives on clinical performance and post-operative sensitivity in non-carious Class V restorations.” This study was one of his first forays into the field of bonding agents and specifically investigating bonding to enamel as well as dentin. The research explored the effect of desensitizing agents on the efficacy of bonding with single-bottle etch and rinse adhesives. His PhD thesis, “Long-term efficacy of ethanol-wet bonding under simulated pulpal pressure,” also involved understanding and optimizing bonding to hydrophilic surfaces like dentin. The philosophy behind this study was to replace water in the dentin with ethanol. Drying of dentin causes the collapse of the collagen fibrils, thus preventing bonding. Ethanol, if used to replace the lost water, will prevent collapse of

the collagen fibrils while also causing their shrinkage. This shrinkage helps to increase the inter-fibrillar space, thus improving the flow of the bonding agent. Better flow of the bonding agent improves bonding, and ensures longer retention of the restorative material.

Dentinal enzymatic activity has long been understood to hinder good bonding, and Dr. Sartori recently worked on new approaches to inhibiting the enzymatic activity using EDC or Carbodimide. The results of the study, published recently in the *Journal of Dental Research*, are promising: the use of EDC for both self-etch as well as etch-and-rinse approaches resulted in the reduction of matrix-bound collagenolytic enzymatic activities.

Clinical translation of his research into bonding has always been a primary focus for Dr. Sartori. With zirconia becoming one of the ground-breaking materials now being used in our field, he is currently working on improving the bonding of zirconia to dentin and enamel. The aim of his research is to enable the minimal reduction of tooth structure while ensuring that a zirconia restoration can withstand masticatory forces. The only way to make this possible is to ensure there is a strong bond between the zirconia and the remaining tooth structure. With improved bonding, the use of either monolithic or layered zirconia as a veneer with minimal tooth reduction is a possibility.

The strongest motivation for Dr. Sartori to complete his PhD was his love

for teaching. He strongly believes in spreading his love for research and restorative dentistry to young dentists. Towards this end, he was an Associate Professor at his alma mater, the University of Southern Santa Catarina at Tubarão, SC, Brazil, in the Department of Restorative Dentistry, Division of Operative Dentistry. He has continued to educate budding dentists in the US as Associate Professor in Restorative Sciences at the Herman Ostrow School of Dentistry of USC.

One of the biggest challenges Dr. Sartori faced both academically and personally was his decision to move to the US in order to complete part of his PhD. Though he was a visiting scholar at the Herman Ostrow School of Dentistry of USC, and the School of Dental Medicine at Case Western Reserve University in Cleveland, his permanent move to the US was difficult. However, the city of Los Angeles is now home to Dr. Sartori and his wife, who is also a practicing dentist.

Having always been interested in expanding the horizons of his education, Dr. Sartori invested his time training with CEREC, which has been at the forefront of dentistry's steps in CAD-CAM engineering. He has also learned histological techniques for research and teaching activities, as well undergoing training in electron microscopy in Brazil.

Dr. Sartori maintains collaborations with researchers from all over the world. In light of his international stature, Dr. Sartori was named Associate Editor of the *Brazilian Journal of Health Research* and *Quintessence of Dental Technology*. He is also a sci-

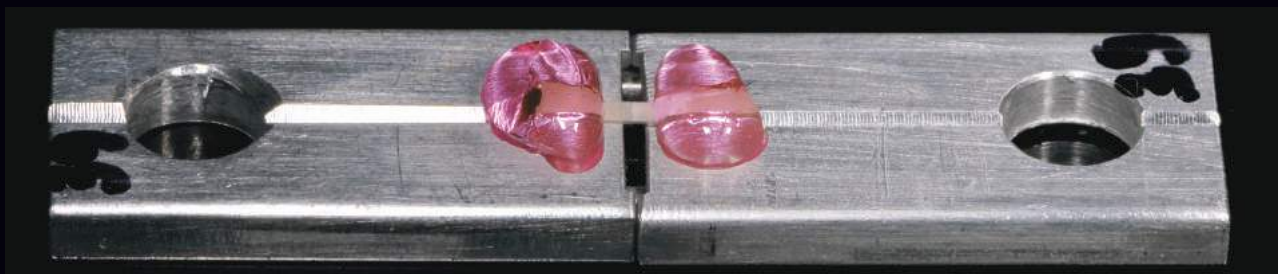


Dr. Neimar Sartori, DDS, PhD, Associate Clinical Professor

entific reviewer for the *Journal of Dentistry*, *Journal of California Dental Association*, *Acta Biomaterialia Odontologica Scandinavica*, *European Journal of Dentistry* and many other high-impact journals.

Dr. Sartori strongly believes the future of dentistry is not just about better biomaterials, which restore tooth structure along with aesthetics, but in better understanding the genetic aspects of tooth development and eruption. Stem cells have been making waves in dentistry, with the regenerative potential of the pulp being studied extensively worldwide. Biomimetic dentistry, bioregenerative dentistry, and aesthetic dentistry working together would be an ideal future for the dental world.

Great educators motivate and ignite imagination while instilling a love for learning. Dr. Sartori hopes to achieve this by inspiring greater development in the future of dentistry, both through his teaching and his research into the complexities of biomaterials.



Microtensile bonding strength testing device. It is used for testing the micro-tensile bonding strength between the restorative materials and the hard dental tissues. Image courtesy of Dr. Neimar Sartori.