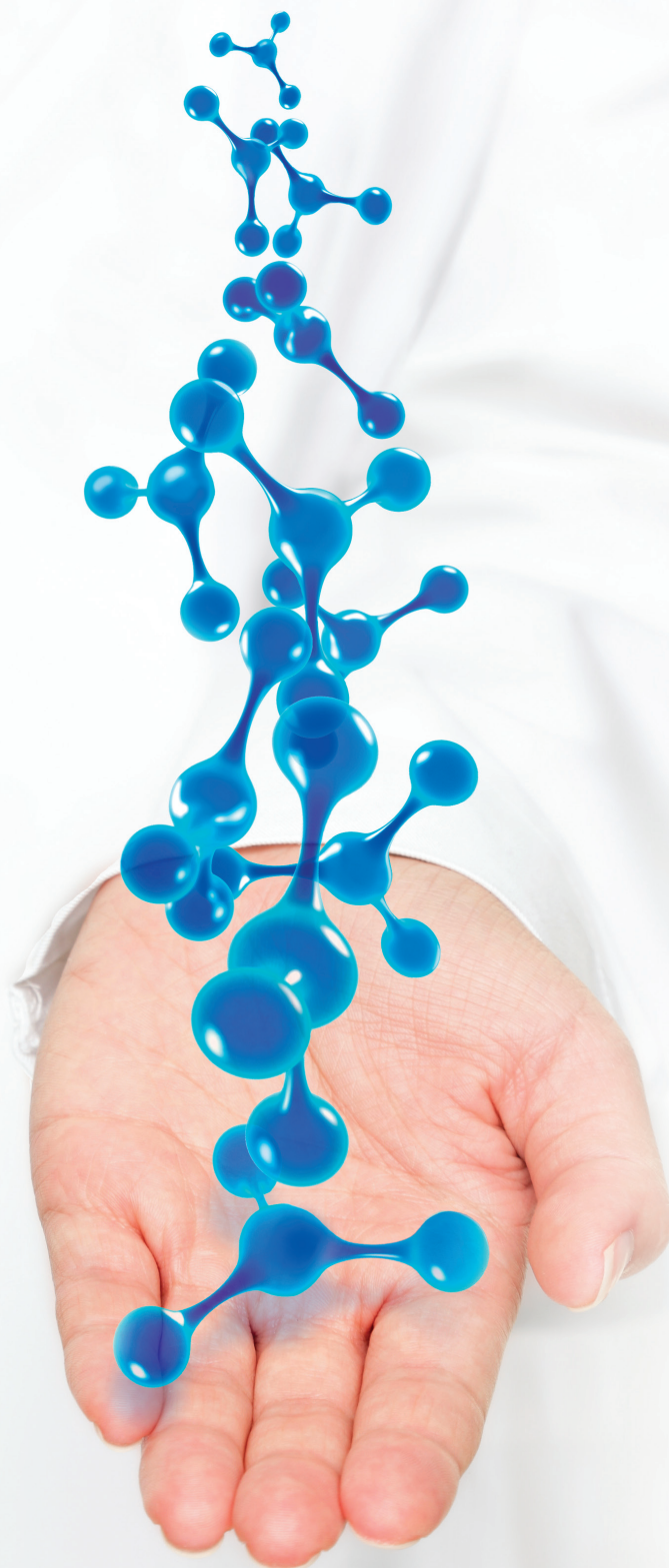


The Future of Dentistry Now in Your Hands

Changes everything you
know about traditional
Composites, Glass Ionomers
and RMGIs



PULPDENT®

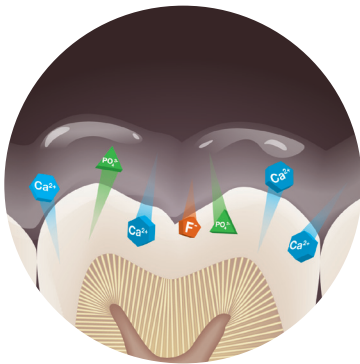
BioACTIVE Products for ProACTIVE Dentistry

Advances in dental materials make possible a proactive approach to patient treatment and oral health care. Bioactive materials that behave favorably in the moist oral environment, neutralize conditions that cause dental caries, provide prevention benefits, and maximize the potential for remineralization will become the accepted standard of care.

Mimics Nature

ACTIVA BioACTIVE products are the first dental resins that mimic the physical and chemical properties of teeth. They contain three key components:

- Bioactive ionic resin matrix
- Shock-absorbing rubberized resin compon
- Reactive ionomer glass fillers.



These bioactive products actively participate in the cycles of ionic exchange that regulate the natural chemistry of our teeth and saliva and contribute to the maintenance of tooth structure and oral health.

Strong, Esthetic, BioActive

ACTIVA has the strength, esthetics and physical properties of composites and delivers more fluoride release than glass ionomers,¹ combining the best attributes of both materials without compromising either one.

- Esthetic
- Chemically bonds
- Seals teeth against bacterial leakage^{2,3}
- Releases/recharges calcium, phosphate and fluoride
- Provides long-term patient benefits

Durable

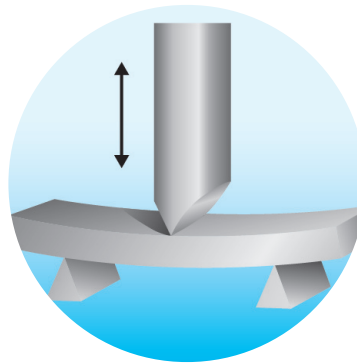
ACTIVA contains water, yet the material has extremely low solubility.^{8,26} The ionic resin matrix facilitates the diffusion of calcium, phosphate and fluoride ions while still maintaining the excellent physical properties associated with resins and composites.

Tough, Fracture Resistant

ACTIVA BioACTIVE products are tougher and more fracture resistant than composites.

Toughness, measured by deflection at break, is the ability of a strong, hard material to absorb stress without fracturing.

Deflection at break of ACTIVA is 2-3 times greater than composites and 5-10 times greater than GIs and RMGIs^{4,5}



Dynamic “Smart” Material

Unlike traditional materials that are hydrophobic, repel water, and are designed to be passive, ACTIVA is moisture friendly and plays a dynamic role in the mouth.



Only moisture friendly materials that are partly water-based or have phases or zones with significant water content can react to changes in the ambient conditions and are capable of this dynamic behavior.⁶

ACTIVA reacts to the continuous pH changes in the oral environment to help fortify and recharge the ionic properties of saliva, teeth and the material itself.^{1,7,9} For this reason, ACTIVA is considered a “smart” material.

No Bisphenol A

- Contain no Bisphenol A, no Bis-GMA, no BPA derivatives
- Two-paste, automix systems
- Three setting mechanisms: light cure, self-cure resin chemistry, and self-cure glass ionomer reaction

Bioactive Materials

Bioactive dental materials that are strong, esthetic and long-lasting offer an alternative to traditional composites, that are strong and esthetic but are passive and without bioactive potential, and to glass ionomers, that are bioactive but have poor esthetics and undesirable physical properties.

The development of bioactive materials is inspired by nature, where water is the source of life. In the oral cavity, saliva is the life source and is rich with water, proteins and ionic components.



The oral environment is exposed to continuous pH cycles, and saliva and tooth structure participate in an endless cycle of mineral exchange.

When the pH is low, the demineralization process releases calcium and phosphate ions from the tooth surface. As the pH rises, these ions are available to interact with fluoride ions in our saliva.

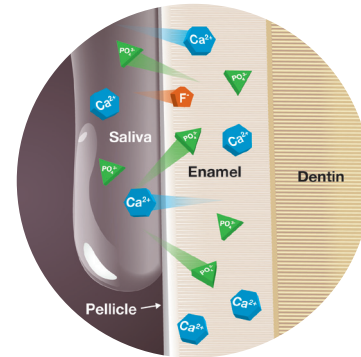
Bioactive materials imitate nature and participate in this dynamic ionic exchange. They are water-based or contain zones or phases of water and continuously release and recharge their ionic components.⁶

They react to the changes in the oral environment to bring about advantageous changes in the properties of saliva, teeth and the materials themselves. This is often referred to as "smart" behavior.⁶

Saliva is a natural caries protection agent and contains the minerals that maintain the integrity of the enamel surface.

It helps maintain the health of the hard and soft tissues, removes waste, and is the first line of defense against microbial invasion.

Bioactive dental materials help regulate the chemistry of teeth and saliva and contribute to the maintenance of oral health.



Ionic Resins

ACTIVA BioACTIVE products are formulated with a patented, ionic-resin (Embrace resin) that contains a small amount of water. It is bioactive, mimics nature and responds to changes in the oral environment.⁹



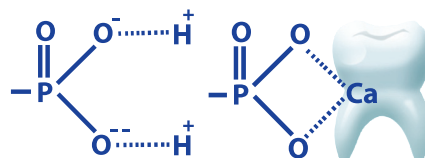
The ionic resin is moisture friendly, which is a requirement of bioactive materials. Water placed next to the ionic resin mixes with the resin.

ACTIVA's ionic resin contains phosphate acid groups with antimicrobial properties^{12,13} that improve the

interaction between the resin and the reactive glass fillers and enhance the interaction with tooth structure.

Through an ionization process that is dependent upon water, hydrogen ions break off from the phosphate groups and are replaced by calcium in tooth structure.

This ionic interaction binds the resin to the minerals in the tooth, forming a strong resin-hydroxyapatite complex and a positive seal against microleakage.^{2,3,14,15,16,25}



ACTIVA participates in a dynamic system of ionic exchange with saliva and tooth structure, continuously releasing and recharging calcium, phosphate and fluoride ions and reacting to pH changes in the mouth.^{1,7,9,11}

Unique properties of the ionic resin:

- Significantly releases and recharges with fluoride^{1,7,11}
- Releases a great amount of phosphate¹¹
- Intimate adaptation to tooth structure.^{2,3,10}
- Exceptional marginal integrity^{10,16}
- Seals against bacterial leakage^{2,3}
- Antimicrobial properties^{12,13}

ACTIVA™ BioACTIVE-BASE/LINER™
ACTIVA™ BioACTIVE-RESTORATIVE™



The US Food & Drug Administration has allowed the claim that ACTIVA BioACTIVE products contain a bioactive resin matrix and bioactive fillers, ushering in a new category of bioactive dental products.

ACTIVA combines all the benefits of composites and glass ionomers while eliminating the disadvantages associated with those materials. ACTIVA BioACTIVE-BASE/LINER has greater fluoride release and bioactive properties than glass ionomers in a strong, resilient resin matrix that will not chip or crumble. It adheres to dentin and does not require etching or bonding agents. ACTIVA BioACTIVE-RESTORATIVE combines the esthetics, strength and resilience of composites with bioactive properties and fluoride release that are superior to glass ionomers.^{1,2,3,4,5,23}

ACTIVA products are the first bioactive dental materials with an ionic resin matrix, a shock-absorbing resin component and bioactive fillers that mimic the physical and chemical properties of natural teeth. They are durable, wear and fracture resistant, chemically bond to teeth, seal against bacterial microleakage, and release and recharge with calcium, phosphate and more fluoride ions than glass ionomers,^{1,7,11} delivering long-term benefits and better oral health care for your patients.

ACTIVA contains no Bisphenol A, No Bis-GMA and no BPA derivatives.

3 Key Components

An unparalleled combination of physical and chemical properties delivers bioactivity, toughness, resilience, durability and marginal integrity

1. Patented bioactive ionic resin
2. Patented rubberized resin
3. Bioactive glass ionomer

Key Properties:

- Natural esthetics - Highly polishable
- Tough, resilient – absorbs shock
- Resists fracture, wear, chipping and crumbling
- Releases and recharges calcium, phosphate and fluoride
- Chemically bonds – Seals against bacterial microleakage
- No sensitivity - Moisture tolerant - Simplified technique

Special Features

- Automix syringe with unique precise placement mix tips
- O2 layer integrates with restorative composites
- No bonding agents required
- Ideal for bulk filling
- Light cure and self-cure
- Depth of cure with light: 4mm

Shows large Class II restored with ACTIVA™ BioACTIVE-BASE/LINER™ and ACTIVA™ BioACTIVE-RESTORATIVE™



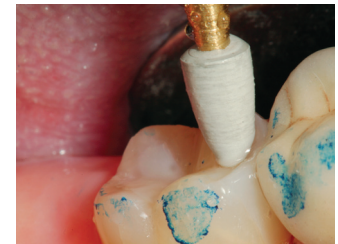
1 Shows prepared tooth
Photos courtesy of Dr. Robert Lowe



2 Shows ACTIVA™ BioACTIVE-BASE/LINER™ after light curing



3 Tooth is etched for 5 seconds with Etch-Rite phosphoric acid gel



4 Finish restoration with ACTIVA BioACTIVE-RESTORATIVE (shown) or composite

Shows cases restored with ACTIVA BioACTIVE-RESTORATIVE. ACTIVA is esthetic and durable and delivers continuous, long-lasting bioactivity and patient benefits.



A1 Shows conservative cavity prep on first molar
Photos courtesy of Dr. Leon Katz



A2 Shows molar restored with ACTIVA™ BioACTIVE-RESTORATIVE™



B1 Shows Class II cavity prep
Photos courtesy of John Comisi, DDS

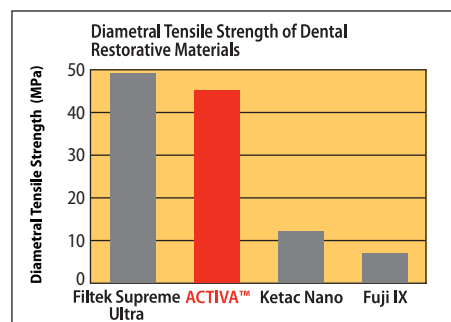
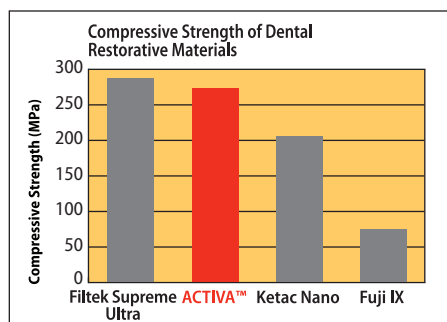


B2 Shows tooth restored with ACTIVA™ BioACTIVE-RESTORATIVE™

Physical Properties

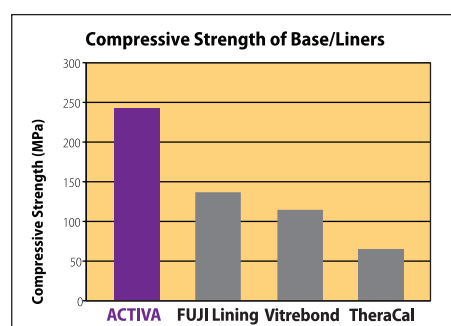
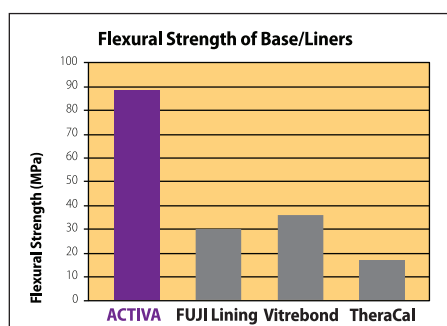
Strength

Compressive and Diametral Tensile Strength of ACTIVA BioACTIVE-RESTORATIVE is comparable to composites and far superior to glass ionomers and RMGIs.



Filtek = Composite; ACTIVA = Bioactive Composite; Ketac Nano = RMGI; Fuji IX = Glass Ionomer
Source: University testing (see back page for trademark information)

Compressive and Flexural Strength of ACTIVA BioACTIVE-BASE/LINER is much greater than resin-modified base/liners and RMGIs.



ACTIVA = Bioactive Base/Liner; Fuji Lining = RMGI; Vitrebond = RMGI; TheraCal = Resin-Modified Calcium Silicate
Source: Pulpdent testing²⁴ (see back page for trademark information)

Toughness, Fatigue Limit, Deflection at Break

ACTIVA's rubberized resin component provides unparalleled toughness and resilience. Toughness, measured by deflection at break using a 3-point bend test, is the ability of a strong, hard material to absorb stress, dissipate forces and resist fracture when a load is applied. Fatigue limit is determined by the incremental load required to cause fracture within a defined number of cycles. The diagram shows a load applied to a hard material in the 3-point bend test.

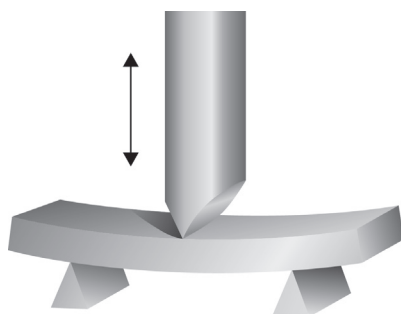


Fig 1: Illustration shows 3-point bend test

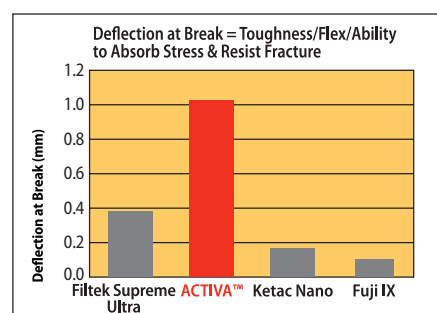


Fig 2: Filtek = Composite; ACTIVA = BioACTIVE Composite; Ketac Nano = RMGI; Fuji IX = GI
Source: University testing²³ (see back page for trademark information)

ACTIVA samples far outperform all leading restorative materials tested for toughness. Deflection at Break of ACTIVA is 2-3 times greater than composites and 5-10 times greater than GIs and RMGIs.

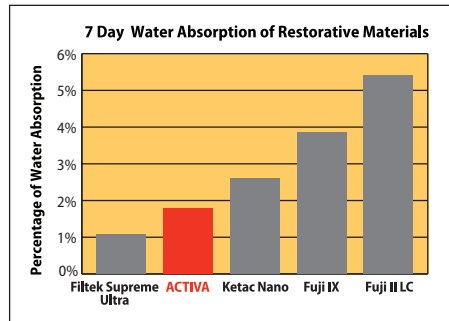
Physical Properties

Water Absorption

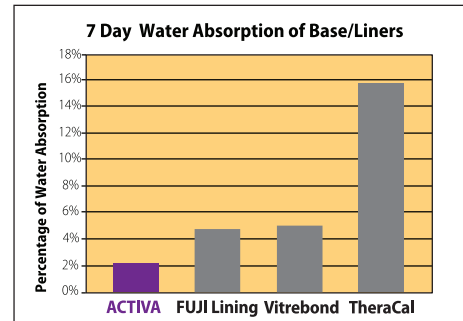
A controlled and relatively low level of water absorption is advantageous for bioactive materials, which require water to unlock their bioactive properties and potential for ionic exchange. Excessive water absorption can compromise the physical properties of restorative and base/liner materials over time.

Water absorption of ACTIVA BioACTIVE-RESTORATIVE is significantly less than glass ionomers and RMGIs, and is designed to be slightly higher than composites, which are hydrophobic and not bioactive.

Water absorption of ACTIVA BioACTIVE-BASE/LINER is far less than RMGIs. Water absorption of TheraCal is 7 times greater than ACTIVA.



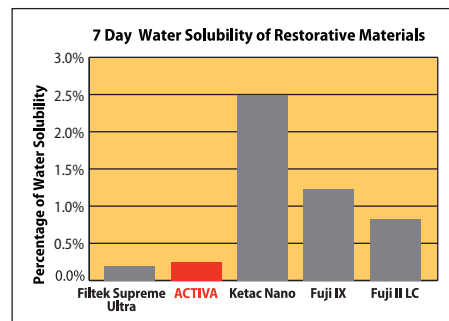
ACTIVA = BioACTIVE Composite; Filtek Supreme Ultra = Composite; Ketac Nano = RMGI, Fuji IX = GI; Fuji II LC = RMGI
ACTIVA = BioACTIVE Base/Liner; Fuji Lining & Vitrebond = RMGI; TheraCal = Resin-Modified Calcium Silicate
Source: Pulpdent testing^{8,26} (see back page for trademark information)



Water Solubility

Low water solubility is important for ensuring the durability and longevity of a dental material. The patented resins and reactive glass fillers in ACTIVA products are balanced to deliver both bioactivity, which requires water, and durability. This unique combination of attributes, when combined with esthetics, sets ACTIVA apart from all other restorative materials.

ACTIVA has remarkably low water solubility that compares favorably with leading composites and is far lower than glass ionomers and RMGIs.

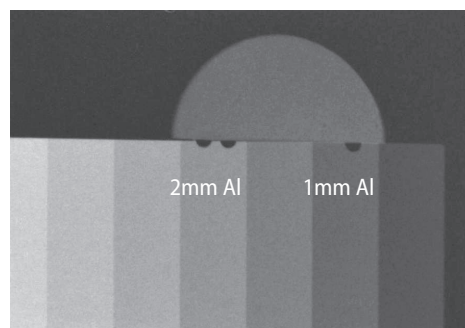


Source: University testing²³ (see back page for trademark information)

Radiopacity

The radiograph compares the radiopacity of a 1mm thick circular disk of ACTIVA BioACTIVE-RESTORATIVE to an aluminum step fixture. The steps on the fixture are in half millimeter increments, and notches on the fixture indicate the 1mm and 2mm steps.

The radiopacity of ACTIVA is equivalent to 1.5mm of aluminum.

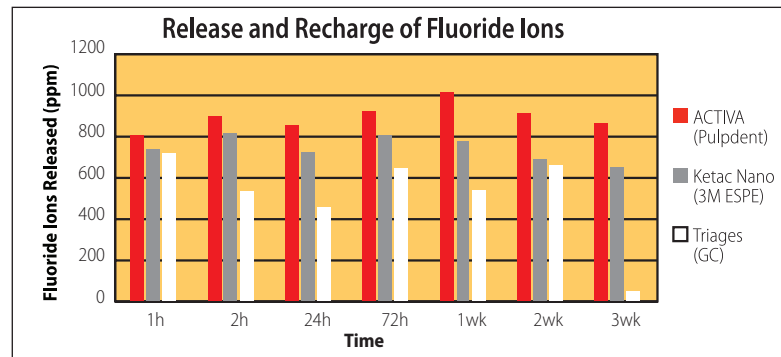


Bioactive Properties

Fluoride Release and Recharge

ACTIVA releases and recharges with fluoride, providing long-term patient benefits for improved oral health care.

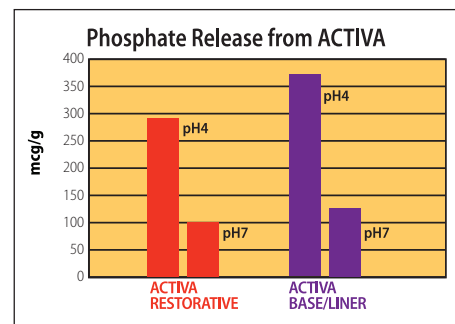
University testing using fluoride ion concentration gradient diffusion methodology shows the pattern of release and recharge of ACTIVA, Ketac Nano and Triage. The study concludes that “at the seven time points tested, the new bioactive material [ACTIVA] has statistically greater fluoride release after recharge at 24 hours, 1 week and 3 weeks compared to the other groups tested.”



Source: University testing²³ (see back page for trademark information)

Phosphate Release

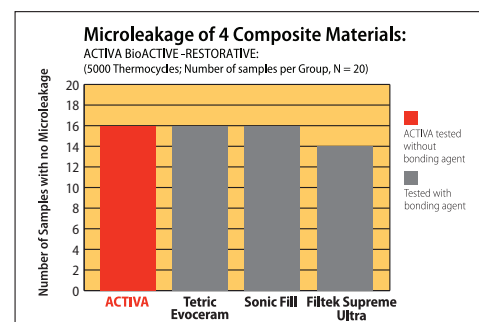
ACTIVA is a “smart” material that responds to pH cycles in the mouth. During low pH demineralization cycles, ACTIVA releases more phosphate. The phosphate ions can reside in the pellicle layer or saliva and are available to interact with calcium and fluoride ions during higher pH cycles.



Source: University testing²³ (see back page for trademark information)

Microleakage

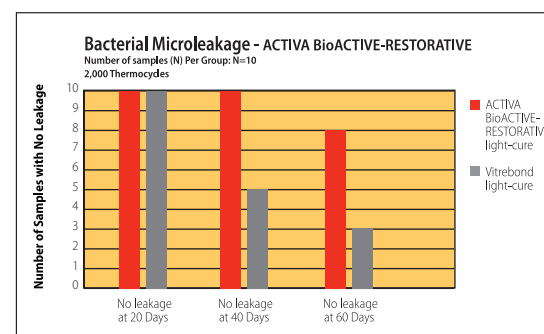
ACTIVA BioACTIVE-RESTORATIVE, when tested in vitro for microleakage *without a bonding agent*, compares favorably with leading composites tested *with a bonding agent* (Scotchbond Universal Adhesive, 3M ESPE).



Source: University testing¹⁶ (see back page for trademark information)

Bacterial Microleakage

ACTIVA BioACTIVE-RESTORATIVE outperforms a leading RMGI when tested for bacterial microleakage in vitro after 2,000 thermocycles.

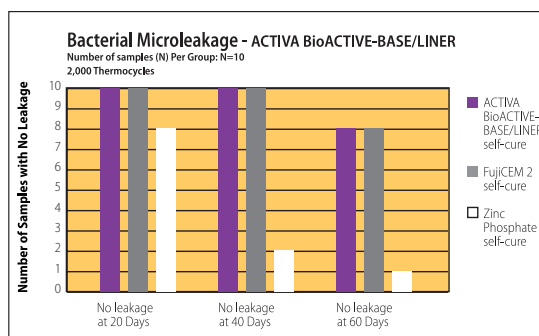


Source: Zmener O, Pameijer CH, et al.² (see back page for trademark information)

Bioactive Properties

Bacterial Microleakage

ACTIVA BioACTIVE-BASE/LINER compares favorably with a leading resin modified glass ionomer material when tested for bacterial microleakage in vitro after 2,000 thermocycles.



Source: Zmerner O, Pameijer CH, et al.² (see back page for trademark information)

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Trademark Information

Filtek, Ketac and Vitrebond are trademarks of 3M ESPE; Fuji IX, Fuji II LC, Fuji Lining, FujiCEM and Triage are trademarks of GC; Tetric EvoCeram, SonicFill and TheraCal are trademarks of Ivoclar Vivadent, Kerr and Bisco respectively.