MATERIALS & PRODUCTS UPDATE 2013

WILLIAM J. DUNN, COL, USAF, DC

COMMANDER, USAFSAM DET 1

DENTAL EVALUATION AND CONSULTATION SERVICE

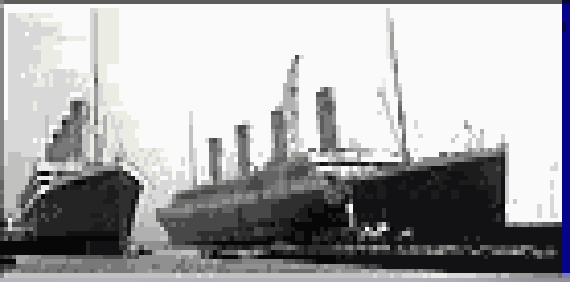
Military Consultant to the Surgeon General

For Materials, Devices and Investigations

DECS

TOPICS

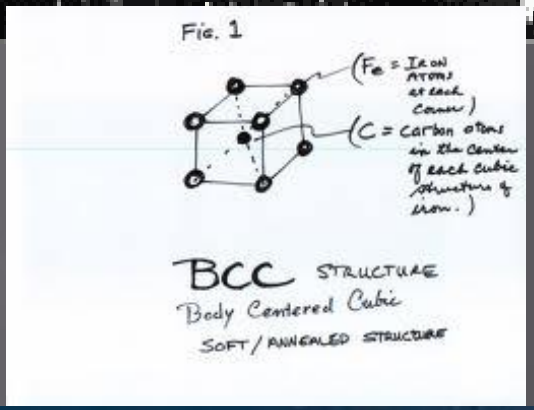
- The ABCs of Elastic Modulus
- Hurricane Damage—is it rising floodwater or wind-driven rain?
- Polymer Propagation and You
- Molecular Bond Attraction: Its Role in Dentistry
- Covalent, Ionic, and Metal Bonds Made Easy
- Biostatistics for Dummies
- Materials Science & Engineering Disasters
- **Dental Materials Update**

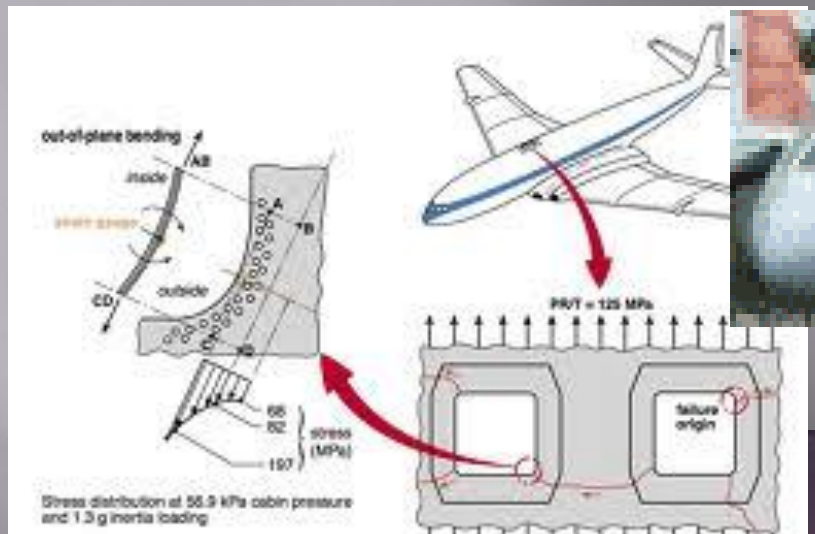


TITANIC PHOTOGRAPHS

FROM THE ORIGINAL GLASS PLATES

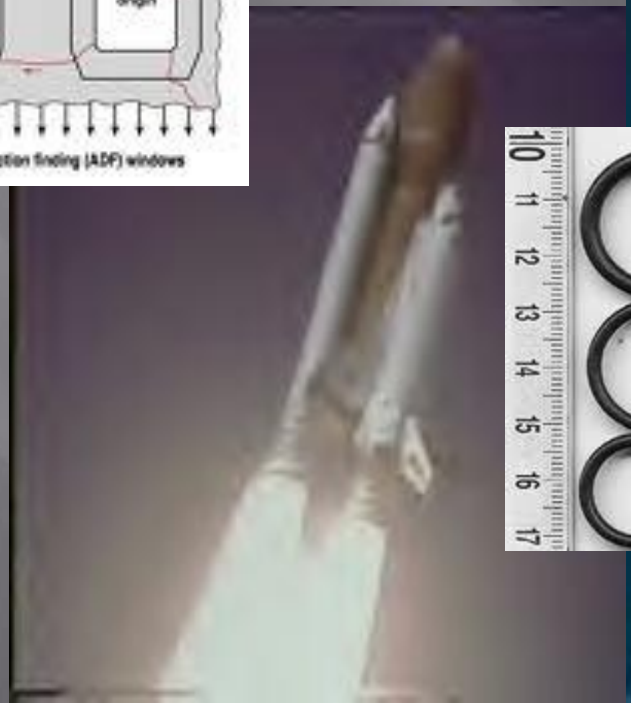












Information on Dental Products



A Note on Dental Products

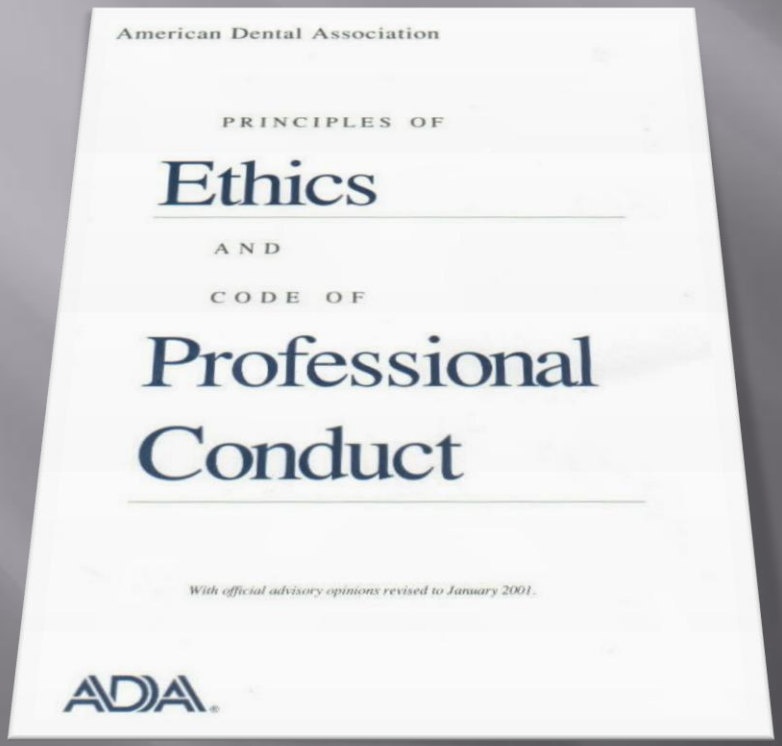


- **510(k) Clearances**
- Section 510(k) of the Food, Drug and Cosmetic Act requires device manufacturers who must register, to notify FDA of their intent to market a medical device at least 90 days in advance. This is known as Premarket Notification - also called PMN or 510(k). This allows FDA to determine whether the device is equivalent to a device already placed into one of the three classification categories. Thus, "new" devices (not in commercial distribution prior to May 28, 1976) that have not been classified can be properly identified.

In other words…

- Because most dental products are “devices” they simply need to prove in 90 days or less that they are safe, not necessarily better.
- Drugs, on the other hand, must demonstrate safety and efficacy in controlled clinical trials that may take years and must prove to be better than previous products.
- In other words, the new product may be no better, and in some cases worse than previous generations.

DISCLAIMER



I have no personal or financial interest in any of the products mentioned in this presentation. The statements and opinions presented are solely that of the presenter/author and not the official policy of the United States Air Force or Department of Defense.

Increased Use of Composite Restorations



121Million

86 Million

71 Million

52Million



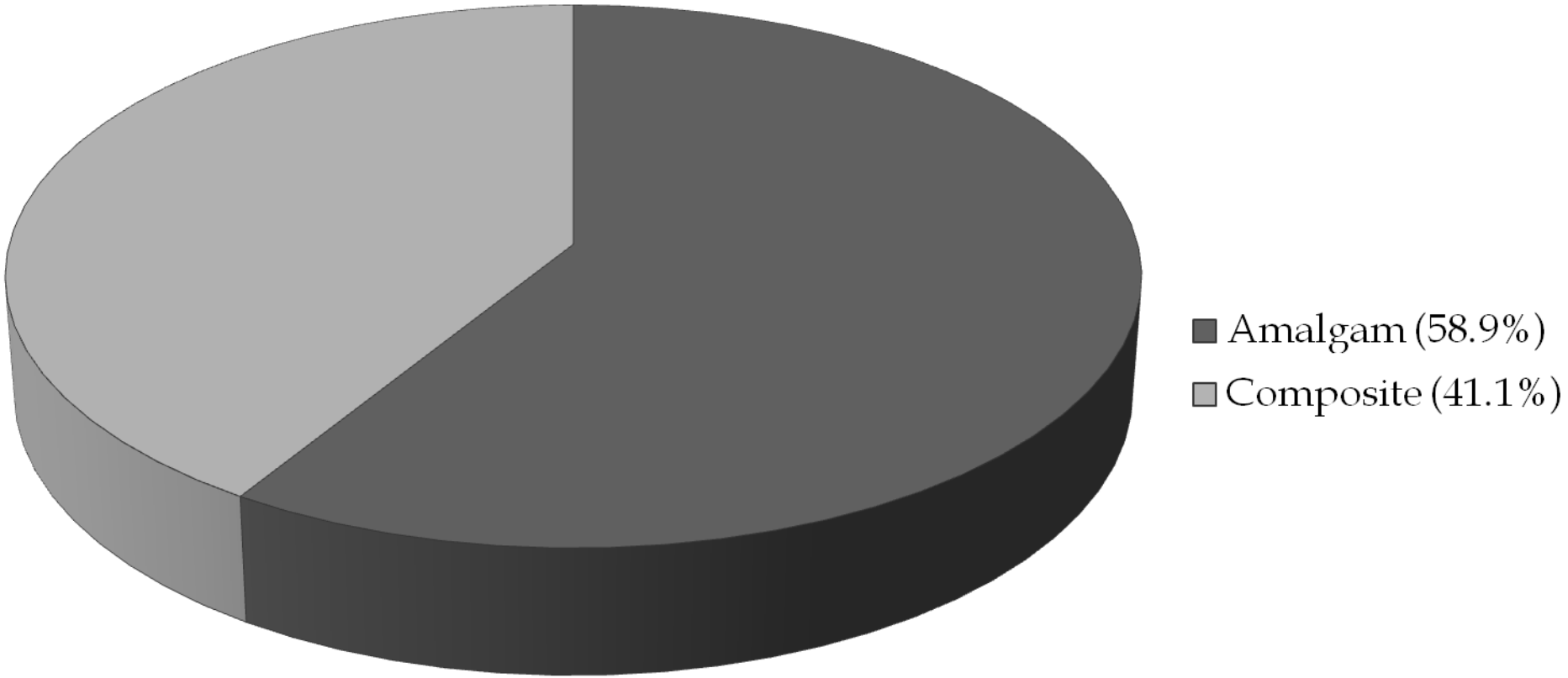
Millions of Restorations

150
100
50
0

1998 1999 2000 2001 2002 2003 2004 2005 2006

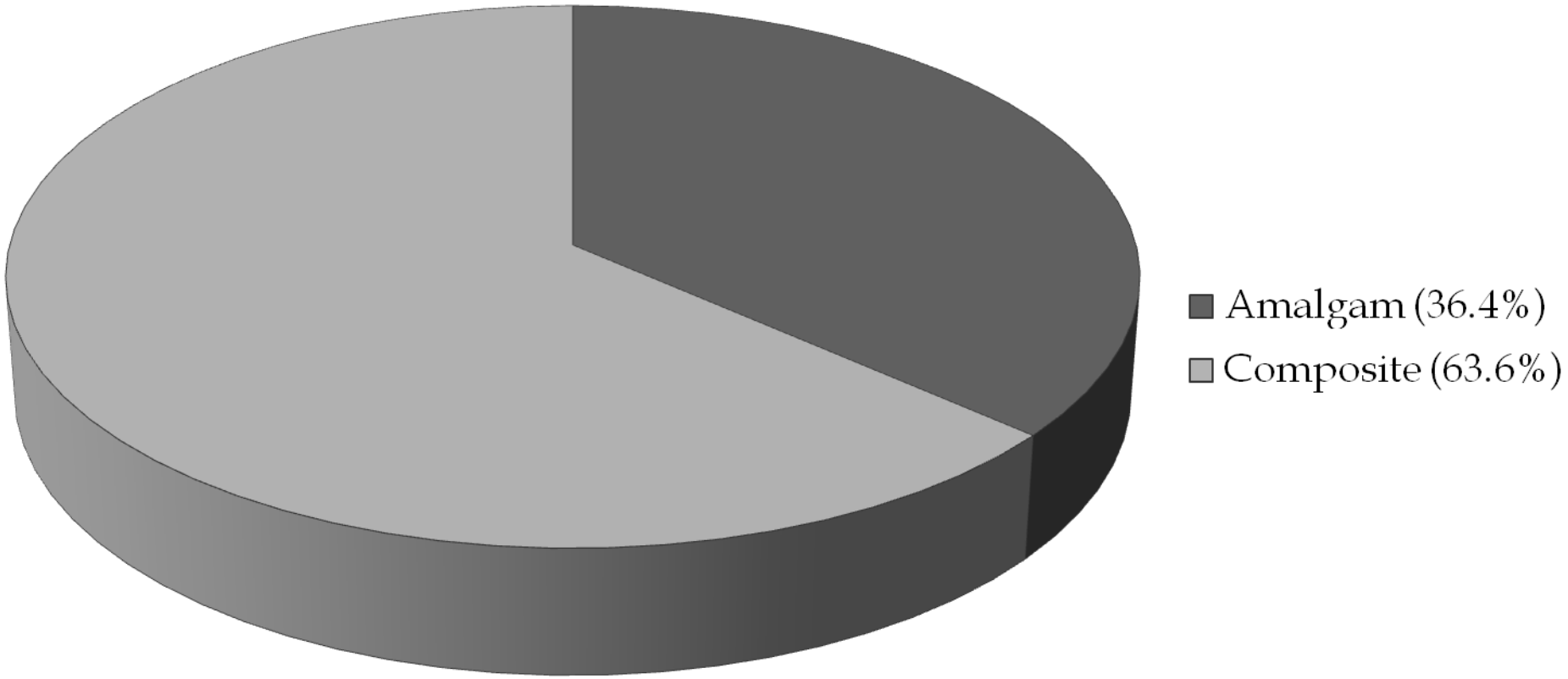
Composite
Amalgam

Total Direct Restorations Class I, II, III



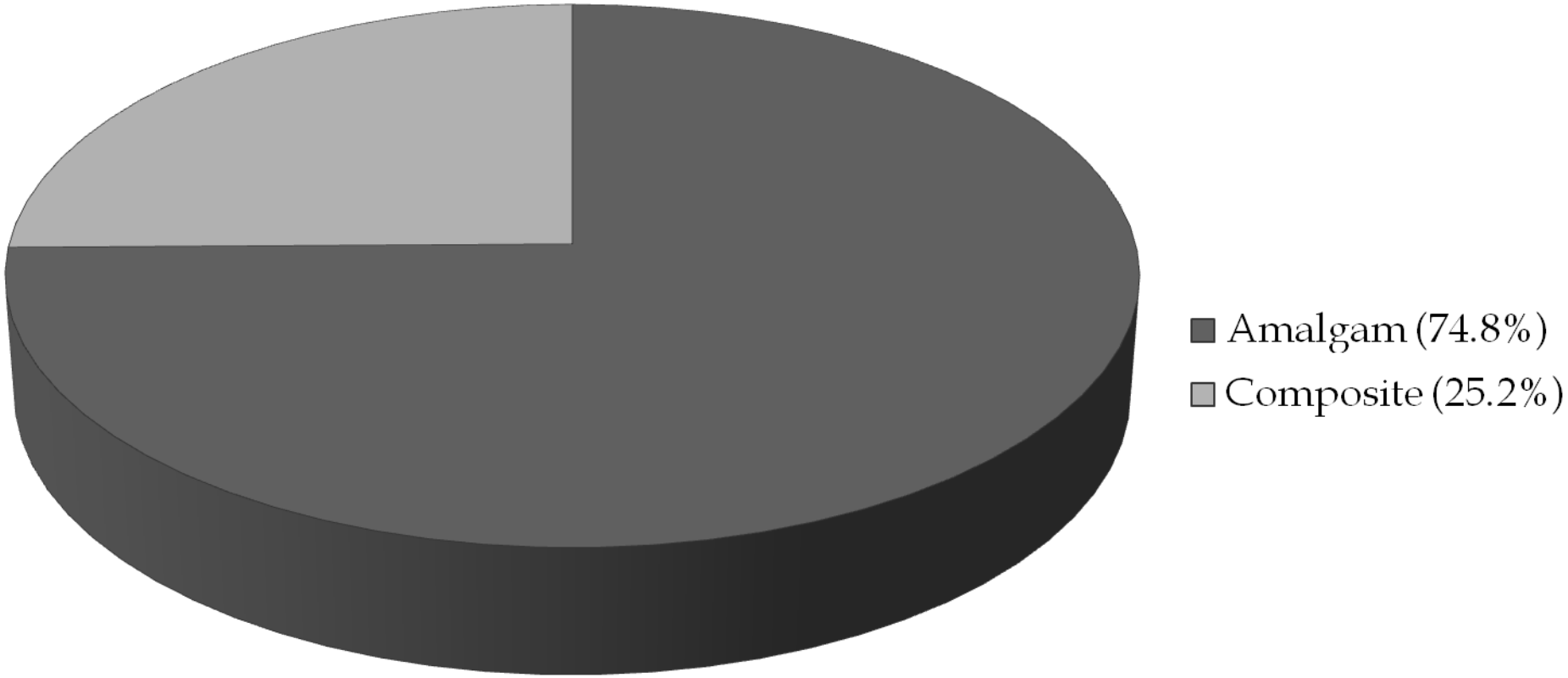
From USAF Dental Service Report FY 2012

Single Surface Direct Restorations



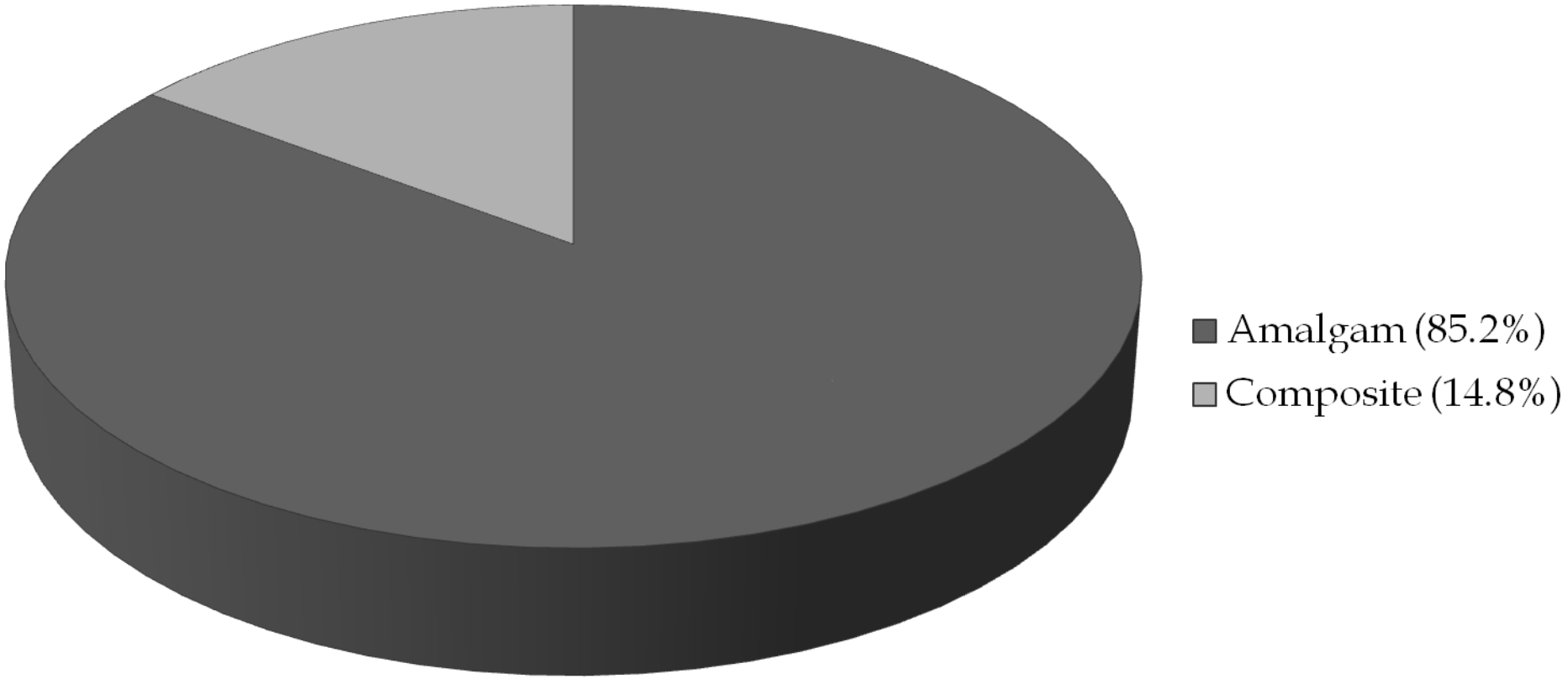
From USAF Dental Service Report FY 2012

Two Surface Direct Restorations



From USAF Dental Service Report FY 2012

Three Surface Direct Restorations



From USAF Dental Service Report FY 2012

Amalgam vs Composite





- Prospective clinical trials have shown comparable annual failure rates of both materials (Manhart et al, 2004)
- Three studies reported better longevity with amalgam (Van Nieuwenhuysen et al., 2003; Bernardo et al., 2007; Soncini et al., 2007)
- Higher secondary caries in composite, but more fracture rates in amalgam (Opdam et al., 2007)
- Large composites more prone to fracture (Opdam et al., 2007; Van Nieuwenhuysen et al., 2003)
- More secondary caries found next to composite restorations than amalgam (Mannocci et al., 2005; Bernardo et al., 2007; Opdam et al., 2007)
- Better survival rate of composite versus amalgam at 12 years in the low risk caries group (Opdam NJM, Bronkhorst EM, Loomans BAC, Huysmans M. *J Dent Res 2010*, 89, 1063-7.

Amalgam versus Composite

- Compomer/composite restorations on posterior teeth in children failed at higher rates than amalgam. *(Soncini JA et al, J Am Dent Assoc 2007)*
- Amalgam appears to be preferable to composite in multi-surface restorations of posterior teeth—survival of amalgam after 7 years was 94.4%, composite 85.5%. Secondary caries most common reason for failure and was 3.5 times greater in the composite group. (Bernardo m, et al, *J Am Dent Assoc 2007)*
- In a general practice two dentists obtained comparable longevity rates after 7 years for one and two-surface amalgam and composite restorations. Keys—smaller restorations, good isolation. (Opdam NJ et al, *Dent Mater 2007*)

Amalgam versus Composite

- In a retrospective study of 2780 records of Navy recruits, 14.2% of amalgam and 16.7 % of composite restorations required retreatment. Authors found significant increases in replacement rates for RBC compared with amalgam due to all causes. *(Simicek JW et al, J Am Dent Assoc 2009*.
- Defective RBC and amalgam class 1 and 2 restorations can be effectively repaired rather than replaced in a three-year study. (*Moncada G, et al. J Am Dent Assoc 2009)*
- Repairs can enhance the longevity of dental restorations considerably—repairs on restorations failing due to caries have a better prognosis compared to repairs due to fracture. *(Opdam NJ et al, J Dent 2012)*

Amalgam versus Composite

- In the vast majority of studies, survival of amalgam restorations was greater than that of composite. Only two studies found a better survival rate for composite:

Amalgam survival better:
Mjor IA, Jokstad. J Dent 1993
Mair LH. Quintessence Int 1998
Raskin A et al. J Dent 1999
Roulet JF. Clin Oral Investig 1997
Plasmans PJ et al. J Dent Res 1998
Mertx-Fairhurst EJ et al. JADA 1998

Composite survival better
Opdam NJ et al. Dent Mater 2007
Opdam NJ et al. J Dent Res 2010

Criticism: most of the studies comparing amalgam versus composite longevity were done using older composites. Notice how the most recent studies (2007, 2010) demonstrated better composite wear!

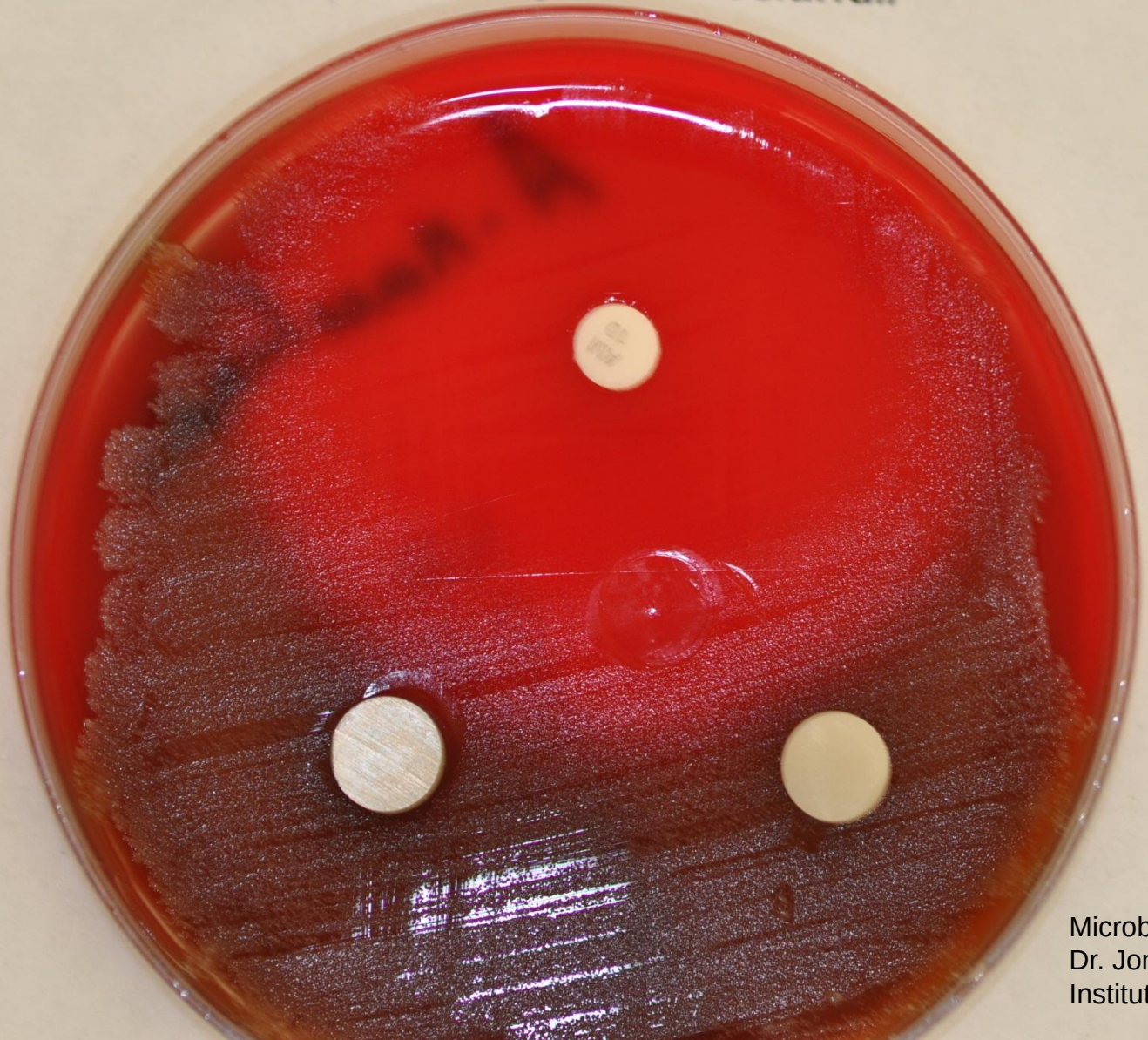
Is amalgam antibacterial?

- Amalgam showed a potent antibacterial effect which lasted for more than one week in all bacteriological tests. The effect of RBC on stopping bacterial growth was minimal and promoted growth of *S. mutans.*
- Composite restorations tend to accumulate more bacterial and dental plaque *in vitro:* Skorland KKR. *Scandinavian Journal of Dental Research 1973;* Skorland KKR. *Journal de Biologie Buccale 1976.*
- Composite restorations tend to grow more bacteria and plaque *in vivo*: Svanberg M et al. *J Dent Res 1990;* Skorland KKR et al. *Acta Odontologica Scandinavica 1982;* Weitman RT and Eames WB. *J Am Dent Assoc 1975.*

Is amalgam antibacterial?

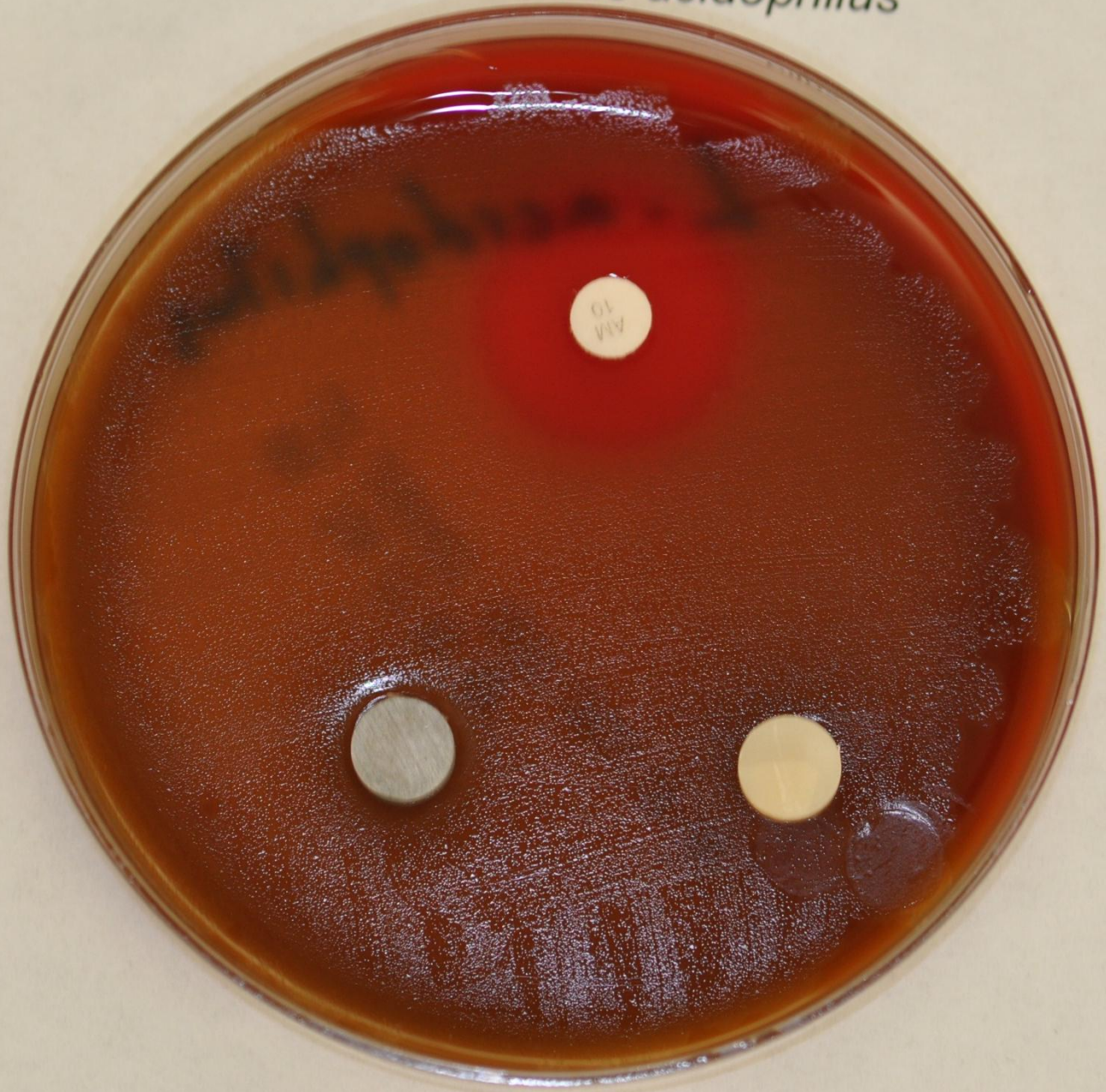
- Remarkably few studies
- This antibacterial observation is not usually the first line argument for amalgam use…so if it were really unarguably true, then amalgam would probably still be the most common dental material used…

Actinomyces naeslundii

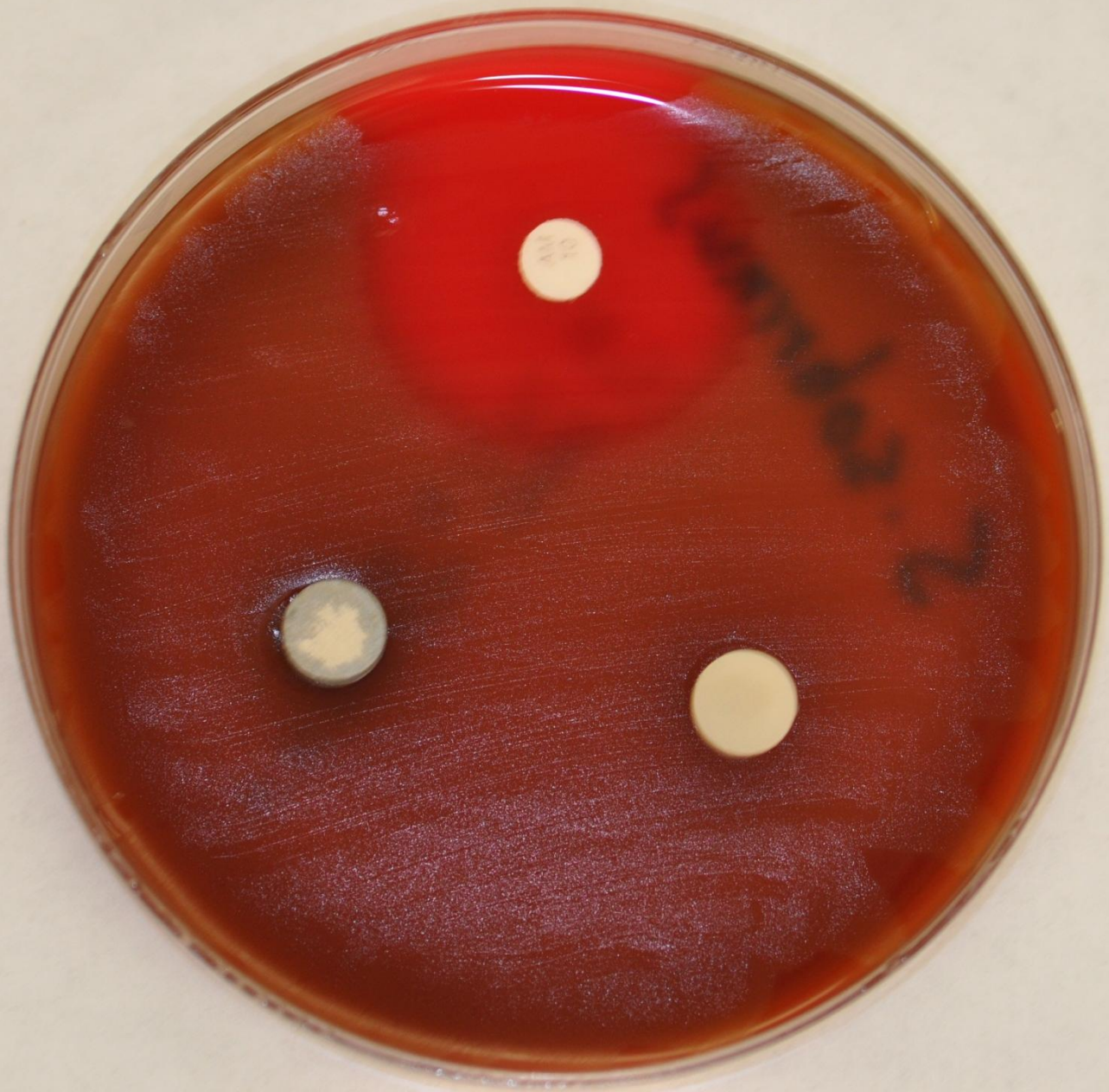


Microbiology courtesy of:
Dr. Jonathan Abercrombie
Institute for Surgical Research

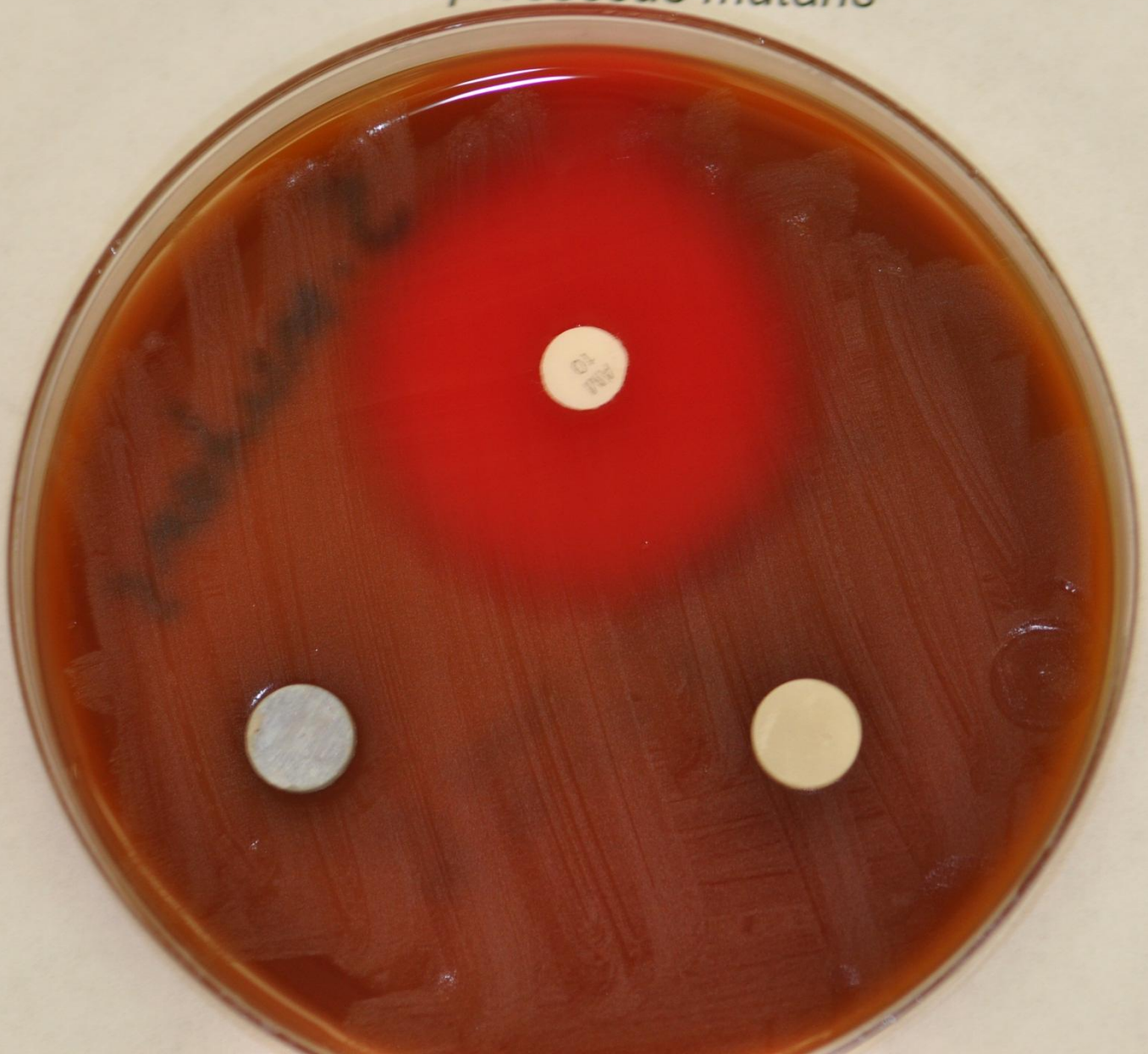
Lactobacillus acidophilus

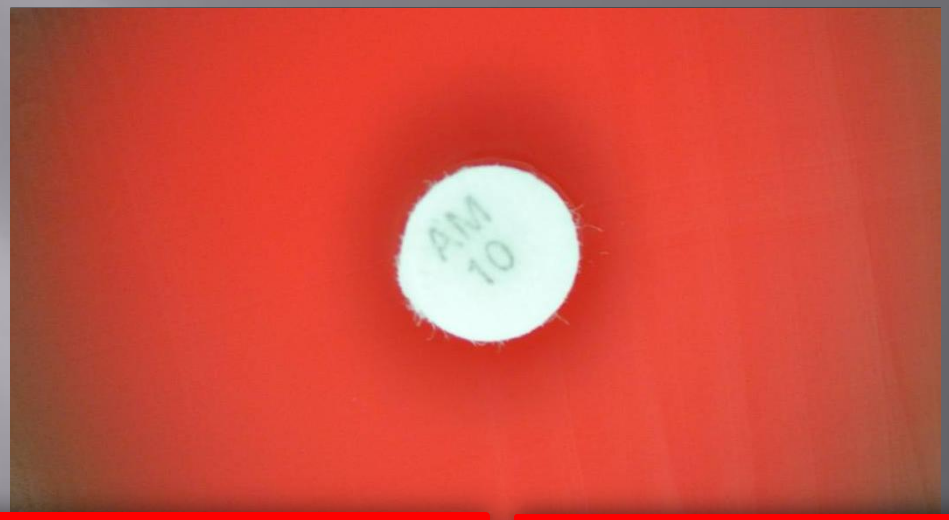


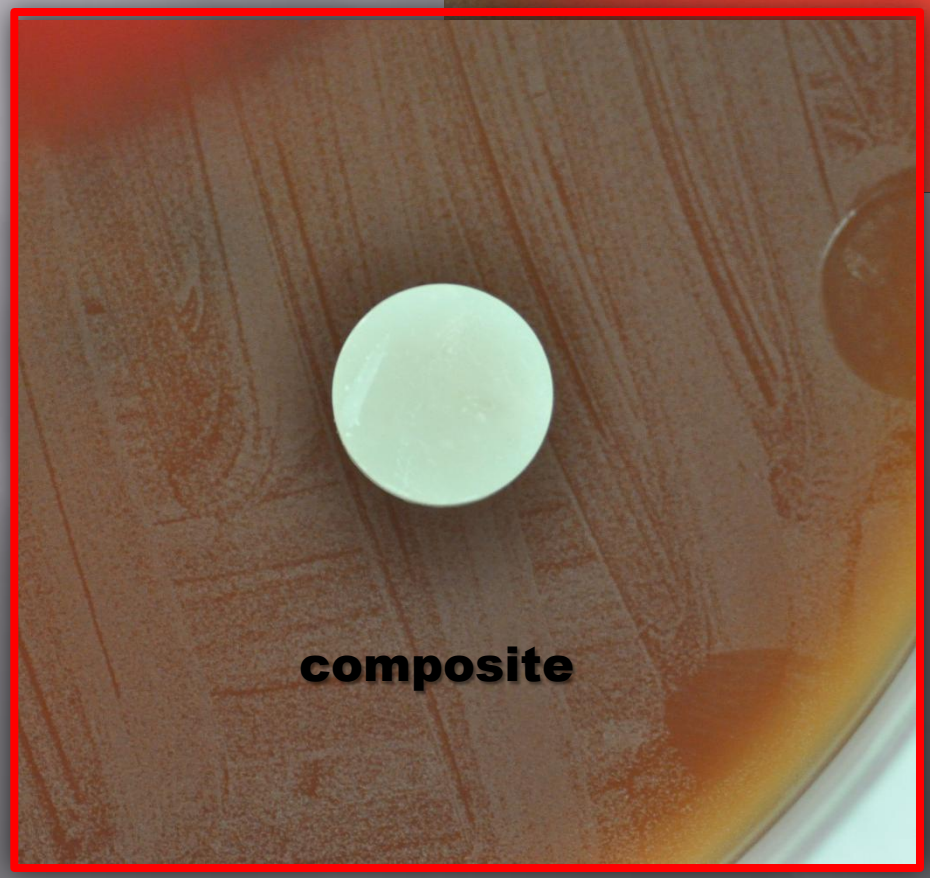
Streptococcus sobrinus



Streptococcus mutans




AM
10


composite


amalgam

Bottom Line on amalgam versus composite

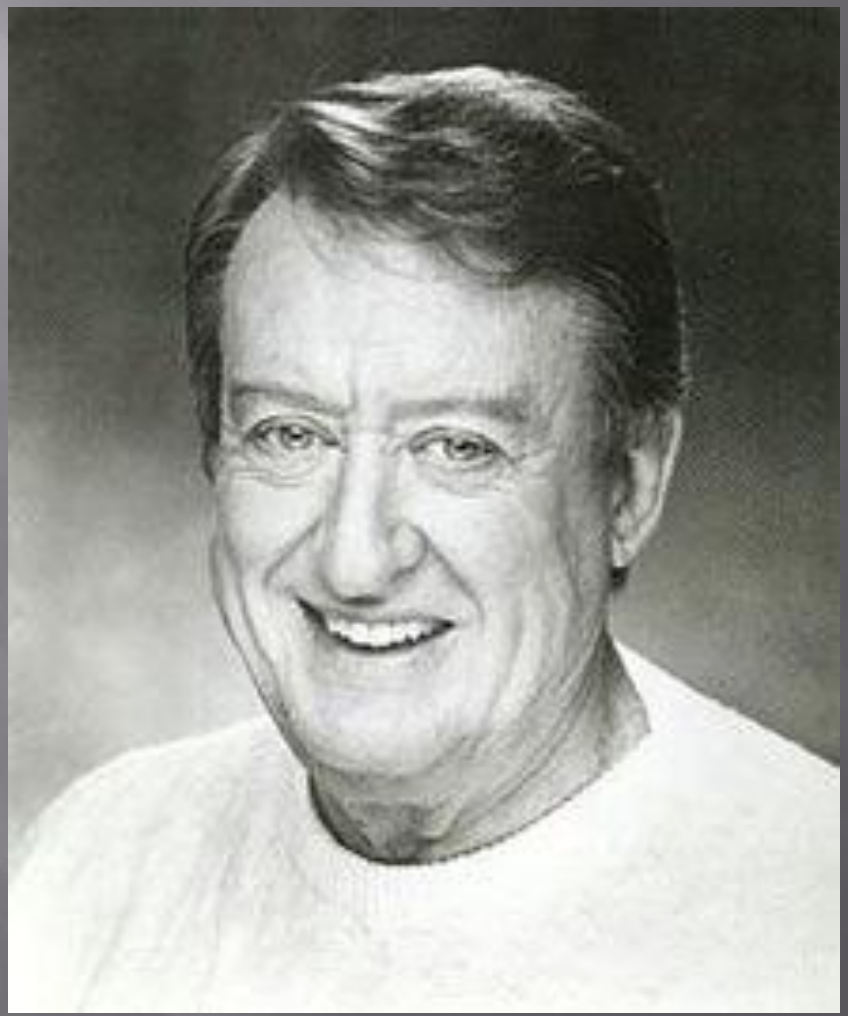
Most studies show that amalgam lasts longer…but…newer studies with newer RBC materials that are more wear-resistant and shrink less demonstrate comparable longevity, especially on more conservative lesions and using excellent technique. Composite may actually reinforce the tooth. Amalgam use continues to decline and may be extinguished bowing to political reasons.

Amalgam contains mercury and is an environmental problem. It is ugly. it requires more tooth structure be removed to retain itself. It is not self adhesive. It does not set on command.

Amalgam is not technique sensitive, can successfully be used in areas of poor isolation, may have some antibacterial properties, is durable and is dimensionally stable while composites still shrink.

Use composite in low/moderate caries risk, more conservative restorations that have margins in enamel…otherwise do sandwich with RMGI. Ask yourself “Am I good enough to do posterior composite dentistry?”

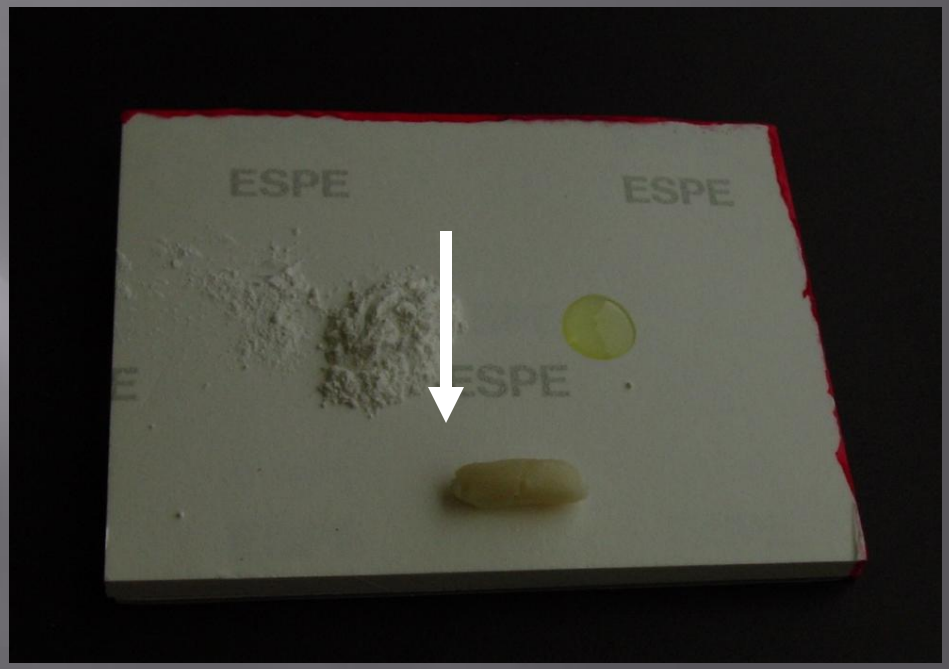
This dentist admited he was a lousy dentist, but took his jewelry making very seriously.



Actor Tom Poston

Composition

1. An organic phase, called the resin matrix
2. A filler
3. A filler-matrix binder, called the coupling agent
4. “new” self adhesive composites



Kerr Vertise™ Flow, Pentron Fusio™



bisGMA

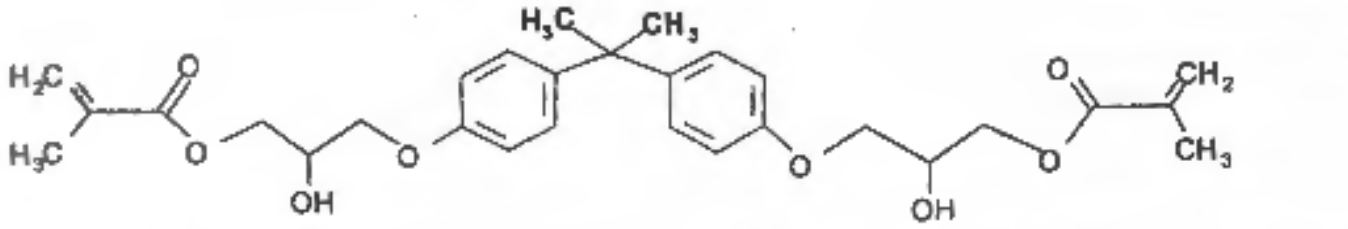


Fig. 7-16 Bis-GMA molecule. The central part of the molecule becomes stiff because of restricted rotational ability of the two rings.

bisGMA monomer is very stiff due to the two phenol rings in the backbone. This explains the high viscosity of bisGMA and why it needs to be diluted with low viscosity monomers such as TEGDMA.

TEGDMA

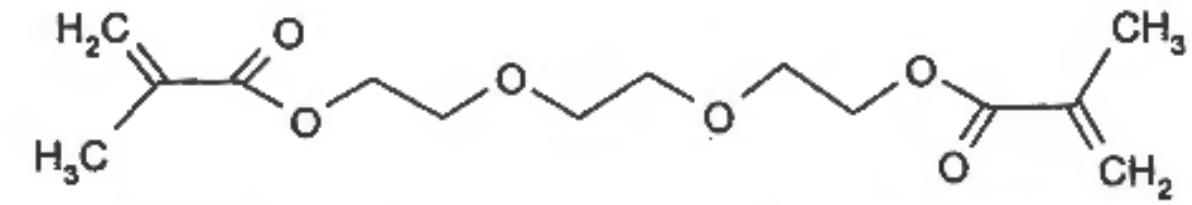


Fig. 7-17 TEGDMA molecule. The backbone structure is flexible, which facilitates molecular interaction during polymerization and increases the degree of conversion.

This molecule can twist and bend easier, and is therefore less viscous. That's why TEGDMA is added to the stiffer bisGMA, so that more filler can be added to it to improve the physical properties. However, the lower molecular weight of TEGDMA and its contribution to higher double bond consumption resulted in increased shrinkage.

UEDMA

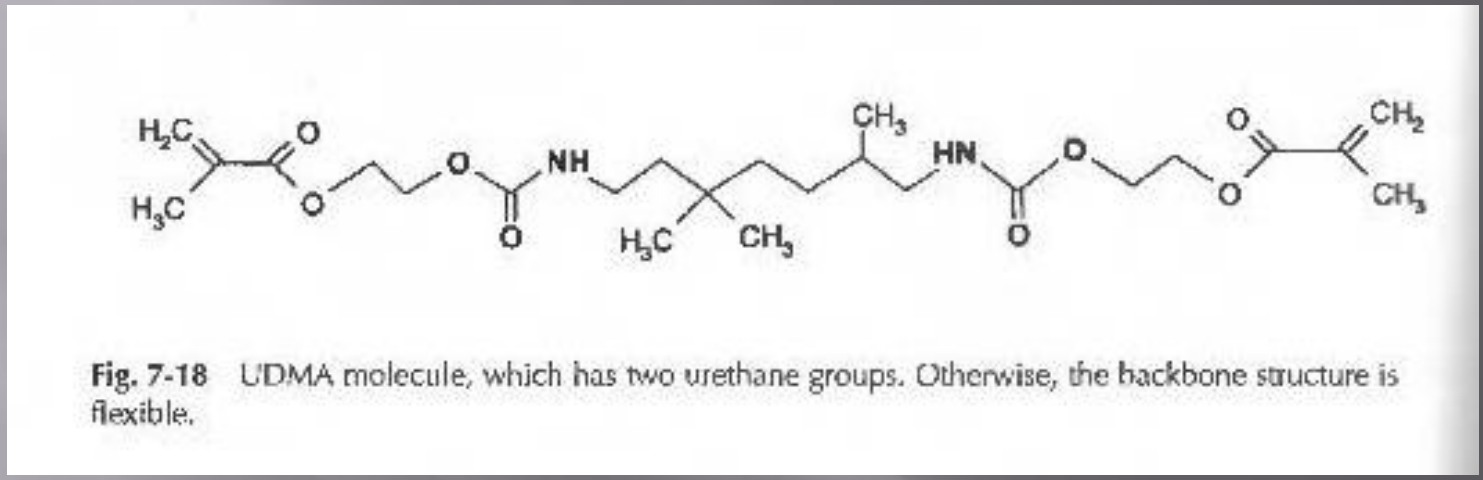
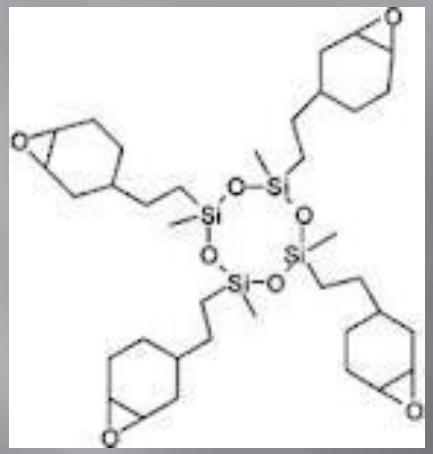


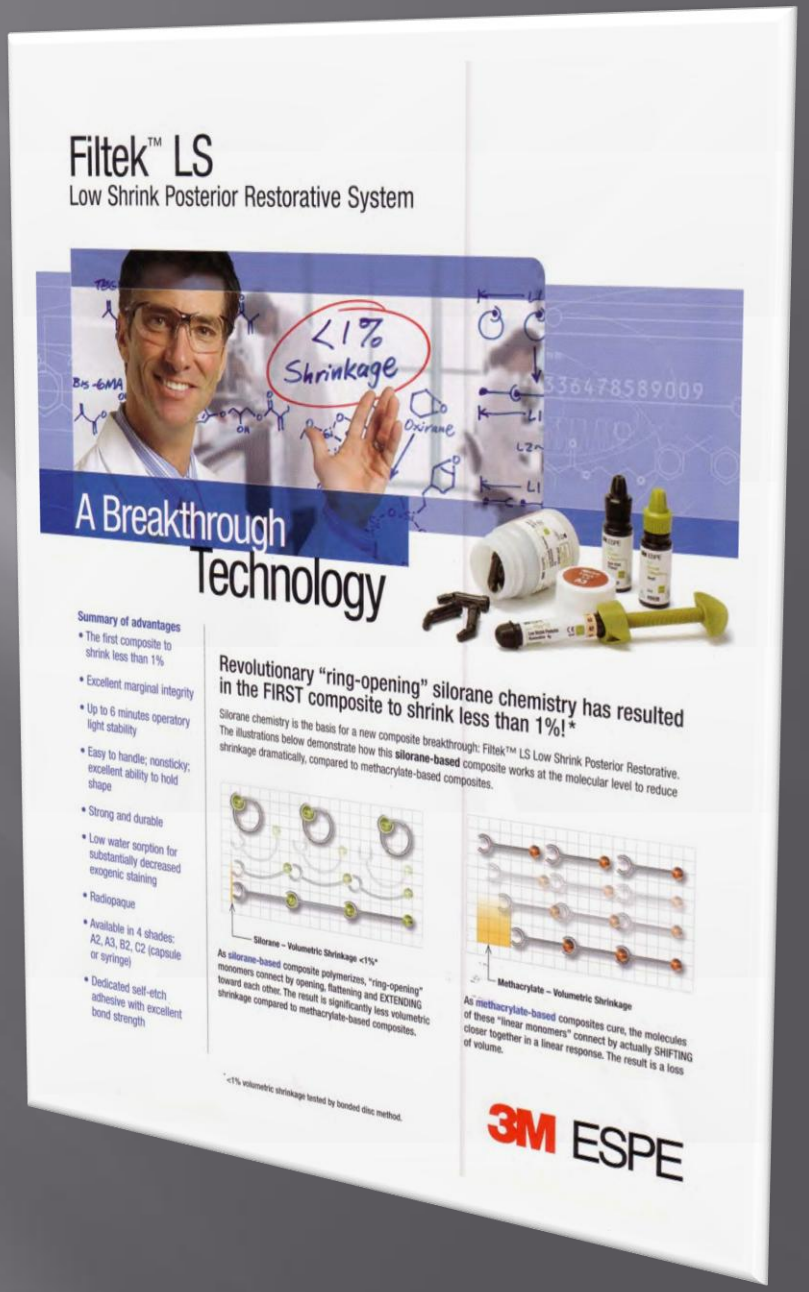
Fig. 7-18 UDMA molecule, which has two urethane groups. Otherwise, the backbone structure is flexible.

UEDMA has higher flexibility, which increases the likelihood of participating with both methacrylate groups in the polymerization process. That means a higher degree of conversion, but also more shrinkage. Also better wear. TEGDMA shrinks more than all of them, however, because of the lower molecular weight.

UDMA and Bis EMA are low viscosity, high molecular weight molecules that can cure almost 4 mm and are responsible for the new bulk fill composites.

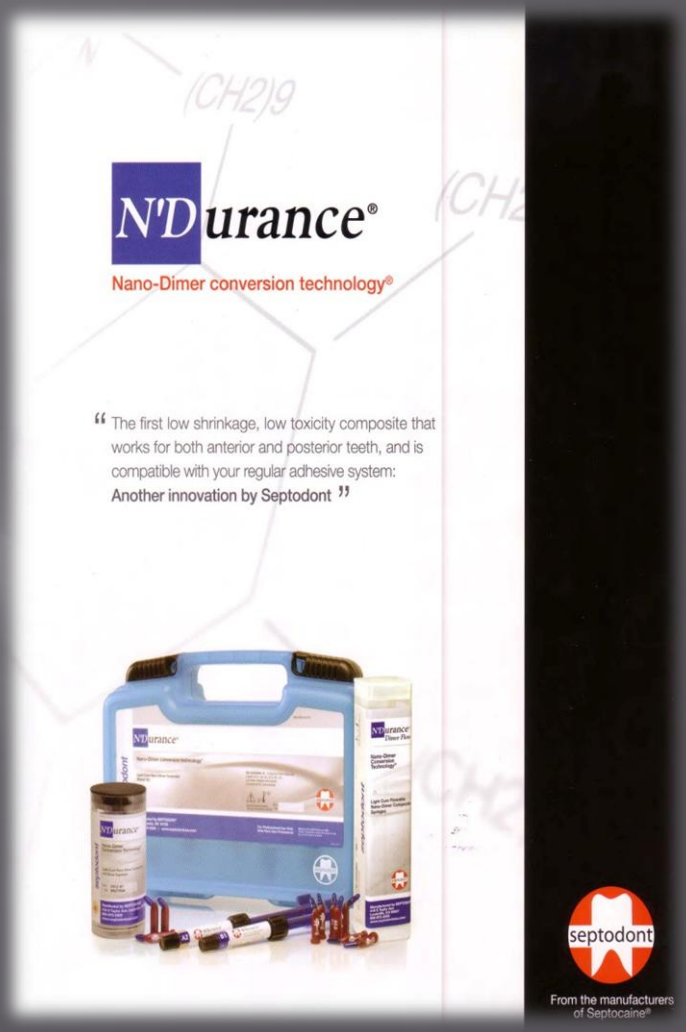
Silorane




Filtek™ LS
Low Shrink Posterior Restorative System
<1% Shrinkage
A Breakthrough Technology
Summary of advantages
• The first composite to shrink less than 1%
• Excellent marginal integrity
• Up to 6 minutes operatory light stability
• Easy to handle; nonsticky; excellent ability to hold shape
• Strong and durable
• Low water sorption for substantially decreased exogenic staining
• Radiopaque
• Available in 4 shades: A2, A3, B2, C2 (capsule or syringe)
• Dedicated self-etch adhesive with excellent bond strength
Revolutionary "ring-opening" silorane chemistry has resulted in the FIRST composite to shrink less than 1%!*
Silorane chemistry is the basis for a new composite breakthrough: Filtek™ LS Low Shrink Posterior Restorative. The illustrations below demonstrate how this silorane-based composite works at the molecular level to reduce shrinkage dramatically, compared to methacrylate-based composites.
Silorane – Volumetric Shrinkage <1%*
As silorane-based composite polymerizes, "ring-opening" monomers connect by opening, flattening and EXTENDING toward each other. The result is significantly less volumetric shrinkage compared to methacrylate-based composites.
Methacrylate – Volumetric Shrinkage
As methacrylate-based composites cure, the molecules of these "linear monomers" connect by actually SHIFTING closer together in a linear response. The result is a loss of volume.
* <1% volumetric shrinkage tested by bonded disc method.
3M ESPE

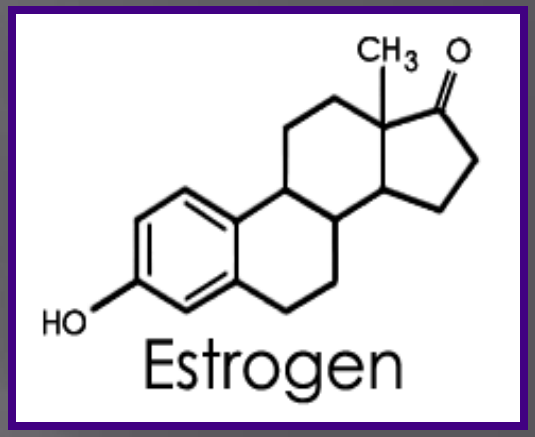
Nano Dimer Acid

- A mix of dimethacrylate monomers based on Dicarbamate Dimethacrylate (DDCDMA), Ethoxylate Dimethacrylate (EBPADMA) and Urethane Dimethacrylate (UDMA)
- Polymer induced phase separation reduces shrinkage effect, also have molecular weight.



Systemic

- Estrogenic effects seen in cell cultures
  - impurities in Bis-GMA-based resins
    - Bis-phenol A in sealants
      - Olea, EHP 1996
  - however, insignificant short-term risk
    - literature review
      - Soderholm, JADA 1999

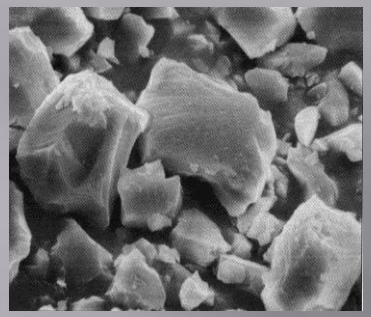


Bisphenol A and Related Compounds in Human Saliva and Urine Associated With the Placement of Composite Restorations
Kingman A, Hyman J, Masten S, Eichmiller F, Dunn WJ, et al; JADA, Dec 2012

Bisphenol A and Other Metabolites in Human Saliva and Urine Associated with the Placement of Composite Restorations (in press)

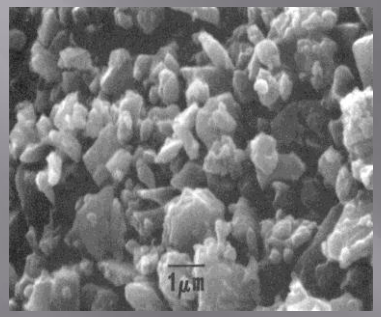
- EPA: maximum acceptable dose for bisphenol A (BPA) is 0.05 mg/kg of body weight per day, which is roughly equivalent to 4.0 mg/kg/day.
- Difficult to directly interpret results because samples were spot samples, not 24-hr urine.
- Average urinary output is 1.5 L/day, then a dose of 0.05 mg/kg-day is equal to 2533 µg/L
- Values in this study were all under 57µg/L.
- **Conclusions: short-term increases in BPA, TEGDMA, Bis-GMA and BPAHPE. Bottom Line: Use a rubber dam.**

Particle Sizes at a Glance circa 2003



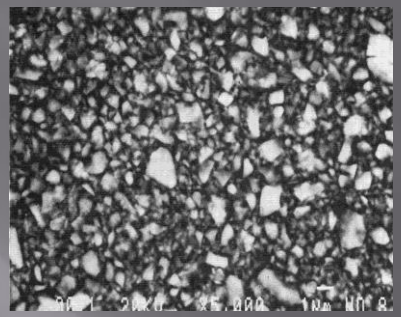
Macrofill

15-35 μm



fine particle

0.5-3.0 μm

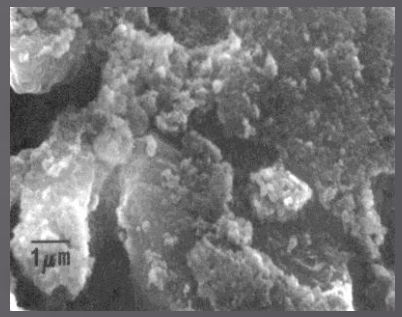


hybrid

0.6-1.0 μm

avg. 0.4μ

e.g., 400 nm



pre-polymerized microfill

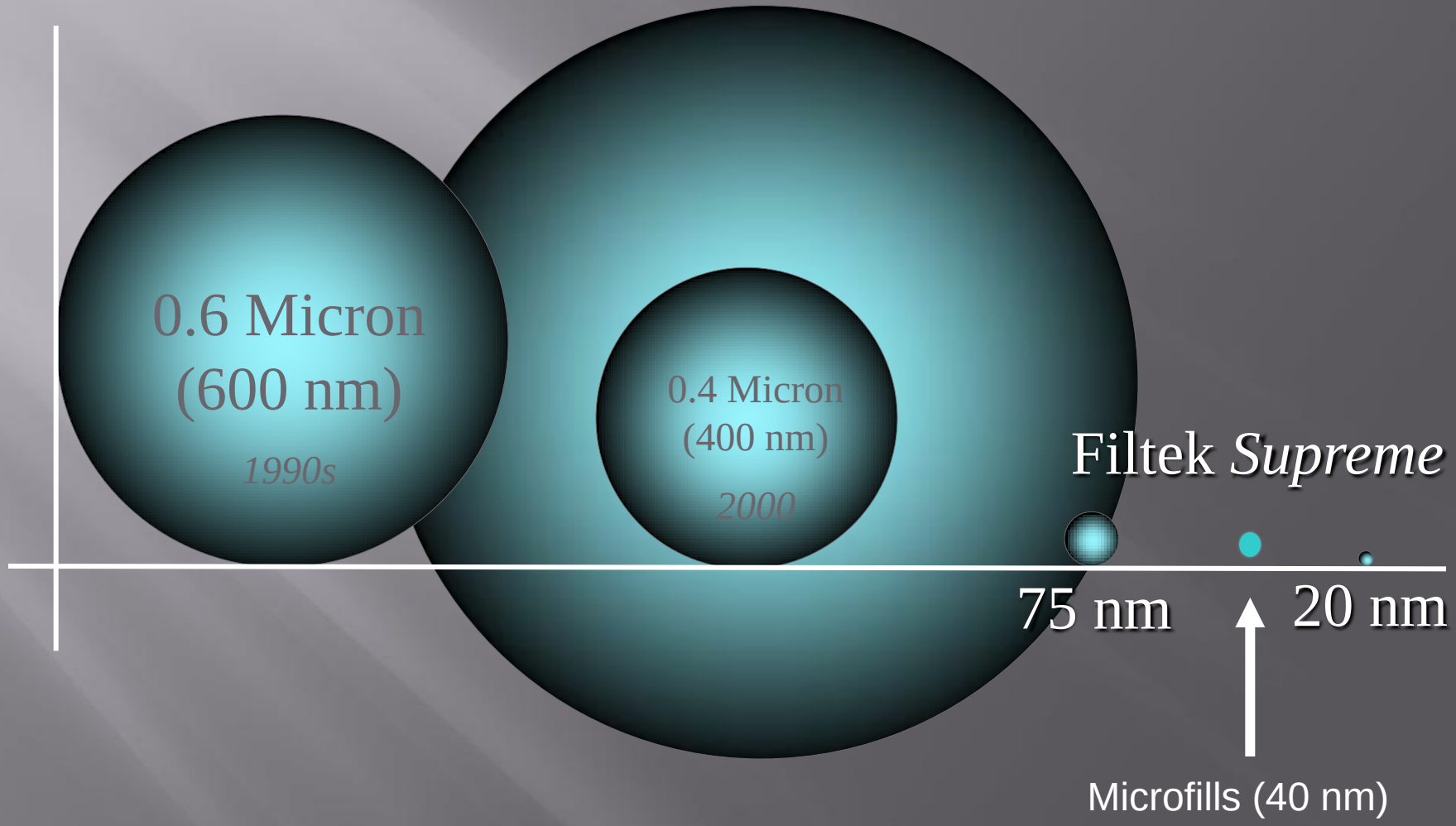
0-20 μ (0.04 μm)

or 40nm

e.g., <100 nm

From: O'Brien: Dental Materials and Their Selection

Nanofiller sizes (10^{-9} m)



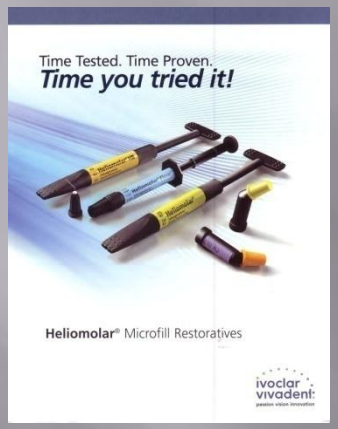
(1 micron = 1000 nanometer)

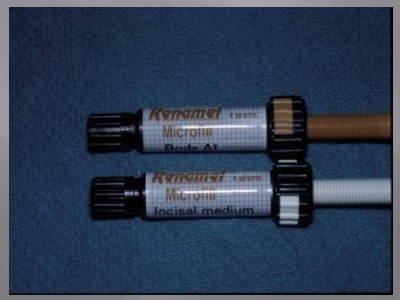
Courtesy of 3M/ESPE

Particle Sizes at a Glance 2012

Microfill

40 nm particles
(<0.1µm)





Microhybrid

<400nm
(<0.4µm)

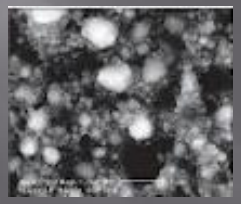




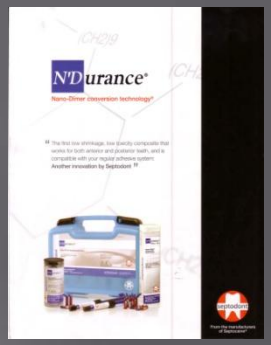
Nanofill

<20-75 nm in clusters
(<0.1µm clusters)





0.02µm particles
sintered into nanoclusters
of 0.6 to 1.4 µm….Zr/SiO2



Ytterbium Fl
Nanoparticles 0.04µm
And nanoclusters 2-8µm,
Ba glass 0.5µm and silica 0.01µm

Nanohybrid

similar to
microhybrids
but higher
nanoparticle
content








N'Durance
Nano-Dimer rheverstion technology

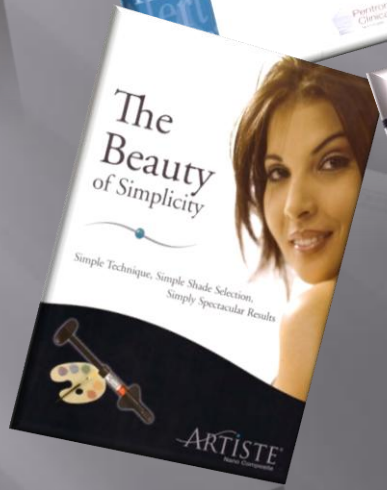

Fusio
Liquid Dentin
A Fusion Of Composite & Adhesive Technology


Filtek LS
Low Shrink Posterior Restorative System
A Breakthrough Technology
3M ESPE


MONDAY.
TUESDAY.
WEDNESDAY.
THURSDAY.
FRIDAY.
TPH3 EVERY DAY.


kuraray
CLEARFIL MAJESTY Esthetic
A Universal Nano-Hybrid Composite


Filtek Supreme Ultra
Flowable Restorative
So many uses, so simple to use.
3M ESPE


The Beauty of Simplicity
Simple Technique, Simple Shade Selection, Simply Spectacular Results
ARTISTE


Simplify
amelogen plus


Heraeus
Venus Diamond® & Venus Diamond® Flow
Venus


BEAUTIFIL II


Your practice is our inspiration...
Herculite Ultra | Where legacy & advanced technology meet
Kerr


VERSATILE, SIMPLE, BEAUTIFUL
Vit-l-escence Esthetics Made Easy


Your practice is our inspiration...
Premise | Strength and beauty you can trust
PREMISE
Kerr


Introducing New & Improved
Tetric EvoCeram
Direct Composite Technology has Evolved!
Tetric EvoCeram
ivoclar vivadent
Time Tested. Time Proven.
Time you tried it!
Heliomolar® Microfill Restoratives
ivoclar
Optimized for better handling!!
Signature Materials From BISCO
KALORE
THE SCIENCE BEHIND THE SMILE
WITH NEW MONOMER TECHNOLOGY
from DuPont
No additional viscosities.
No additional layers.
No additional equipment.
No Compromise!
Tetric EvoCeram Bulk Fill
Introducing
Tetric EvoCeram Bu
NANO-HYBRID COMPOSITE
DISCUS
Subtle made simple.
Nuance Universal Composite
nuance
NEW!
BEAUTIFIL Flow Plus
FINALLY, AN INJECTABLE HYBRID RESTORATIVE FOR ALL INDICATIONS
F00 Zero Flow
F03 Low Flow
REVOLUTIONARY
A BASE, LINER & RESTORATIVE ALL IN ONE
ESTELITE Σ QUICK
Universal Enamel Bond Composite
Tokuyama
2011
REALITY
REALITY CRITICS
Renamel Microfill
Body A2
DENTIN IN A CAPSULE
Biodentine

Bottom Line…Composites

- Better physical properties (due to harder, smaller filler particles, and more wear resistant and more highly curable monomers)
- Better wear
- Smoother
- Better lights

Bulk Filled Composites

- SureFil SDR flow (Dentsply Caulk)
- Tetric Evo Ceram Bulk fill (Ivoclar Vivadent)
- Venus® Bulk fill (Heraeus Kulzer)
- QuiXX Posterior Restorative (Dentsply Caulk)
- SonicFil Restorative (Kerr)
- Filtek BulkFill restorative (3M ESPE)















Bulk Filled Composites

- Most manufacturers say that it is to be used as a flowable base, with an overlay of more highly filled composite.
- Science is lacking in determining whether these are being adequately polymerized at thicknesses exceeding 4 mm.
- Currently, ISO 4049 “Depth of Cure” (DoC) is used, however research exists that demonstrates that this method overestimates DoC.
- History started with “packables” in the 90’s which stated a bulk cure (wrong) and handling similar to amalgam. These products did not fare well because they did not adapt well. They were dry and crumbly. Then the flowable liner idea came along…now this….



Bulk Filled Composites

- ISO 4049 (1998/2009): the composite specimen is filled in a tube shaped mold, light cured, pushed out of the mold, and uncured composite is scraped away. This length is measured and divided by two.
- Hardness appears to be a practical method to indirectly determine degree of conversion. (Asmussen and Peutzfeldt; Vandewalle, Roberts and Dunn; Bouschlicher, Rueggeberg and Wilson; Watts; Dunn and Bush)



Bulk Fill Composites

Time	composite	DoC (mm) ISO 4049 (scrape test)	DoC (mm) 80%VHN (80% hardness)
10 s	Filtek Supreme Plus	2.36	1.0
	Filtek Silorane	1.76	2.0
	Surefil SDR	4.33	2.0
	Venus Bulk Fill	4.81	3.0
	Quixfil	5.72	2.0
	Tetric EvoCeram Bulk Fill	3.32	1.5
20 s	Filtek Supreme Plus	2.68	1.5
	Filtek Silorane	2.09	2.0
	Surefil SDR	4.93	2.5
	Venus Bulk Fill	**6.08**	**4.0**
	Quixfil	6.49	3.5
	Tetric EvoCeram Bulk Fill	3.83	0.2?

Conclusions: For bulk filled materials the ISO 4049 method overestimated DoC compared to DoC determined by Vickers hardness Profiles.

Flury S, Hayoz S,Peutzfeldt A, Husler J, Lussi A. Depth of Cure of resin composites: is the ISO 4049 method suitable for bulk fill materials? Dental Materials 2012; 28:521-28.

Bulk Filled Composites

What about shrinkage stress and bond strength in Bulk filling?

Higher bond strengths are still achieved by layering

At 2.5 mm bulk fill in high C-factor cavities there were high polymerization stresses and lower bond strengths

SDR Bulk fill flowable base generated lower polymerization stresses

At 4 mm bulk fill in a high C-factor cavity, high stresses were found, but Surefill SDR was cured in bulk without a reduction in bond strength and had lower polymerization stresses.

Although flowable composites shrink more than conventional composites their resulting shrinkage stress remains fairly low. This can be attributed to the high stress-relieving internal monomer flow prior to reaching the gel-point, the moment at which stresses start to really build up.

There are more cohesive fractures within these flowable bulk filled materials

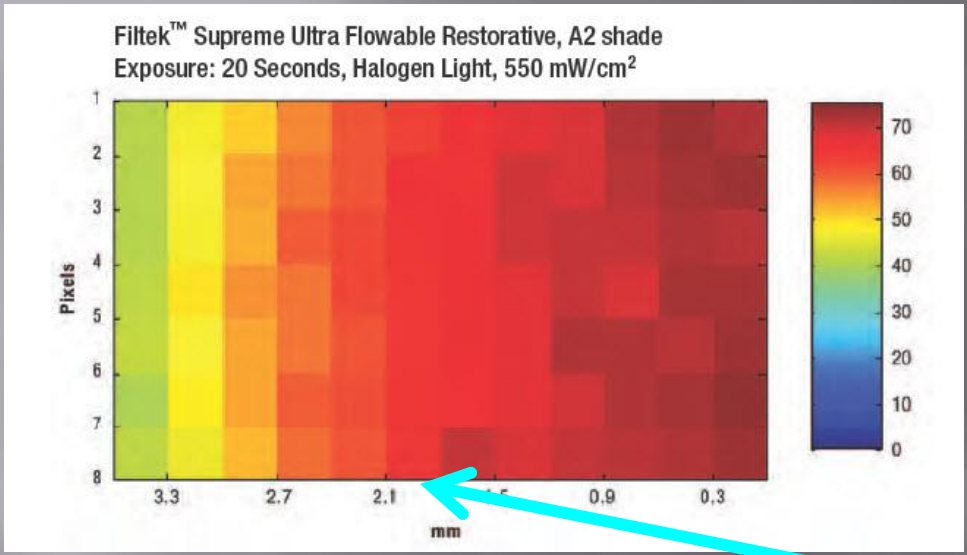
Van Ende, De Munck, Van Landuyt, Poitevin, Peumans, Van Meerbeek. DentalMaterials (in press) Jan 2013.

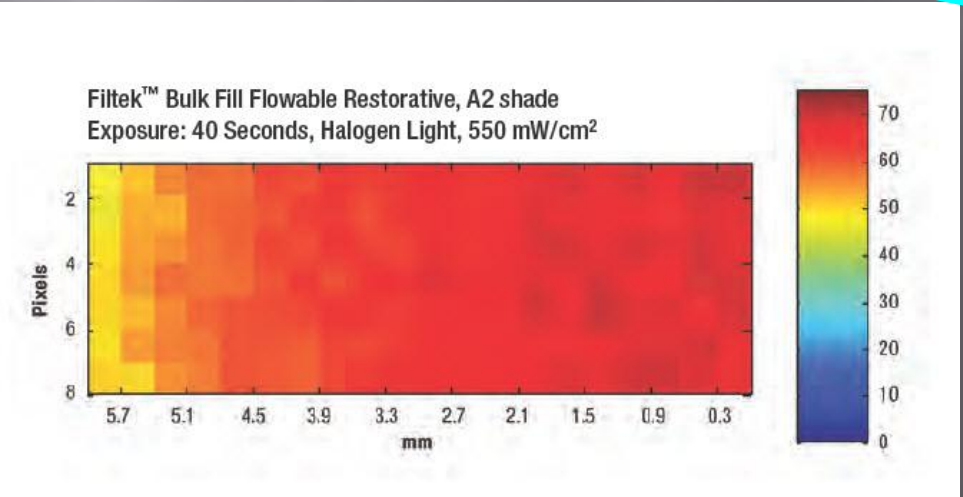
Filtek™ Bulk Fill

Flowable Restorative



Bulk Filled Composites

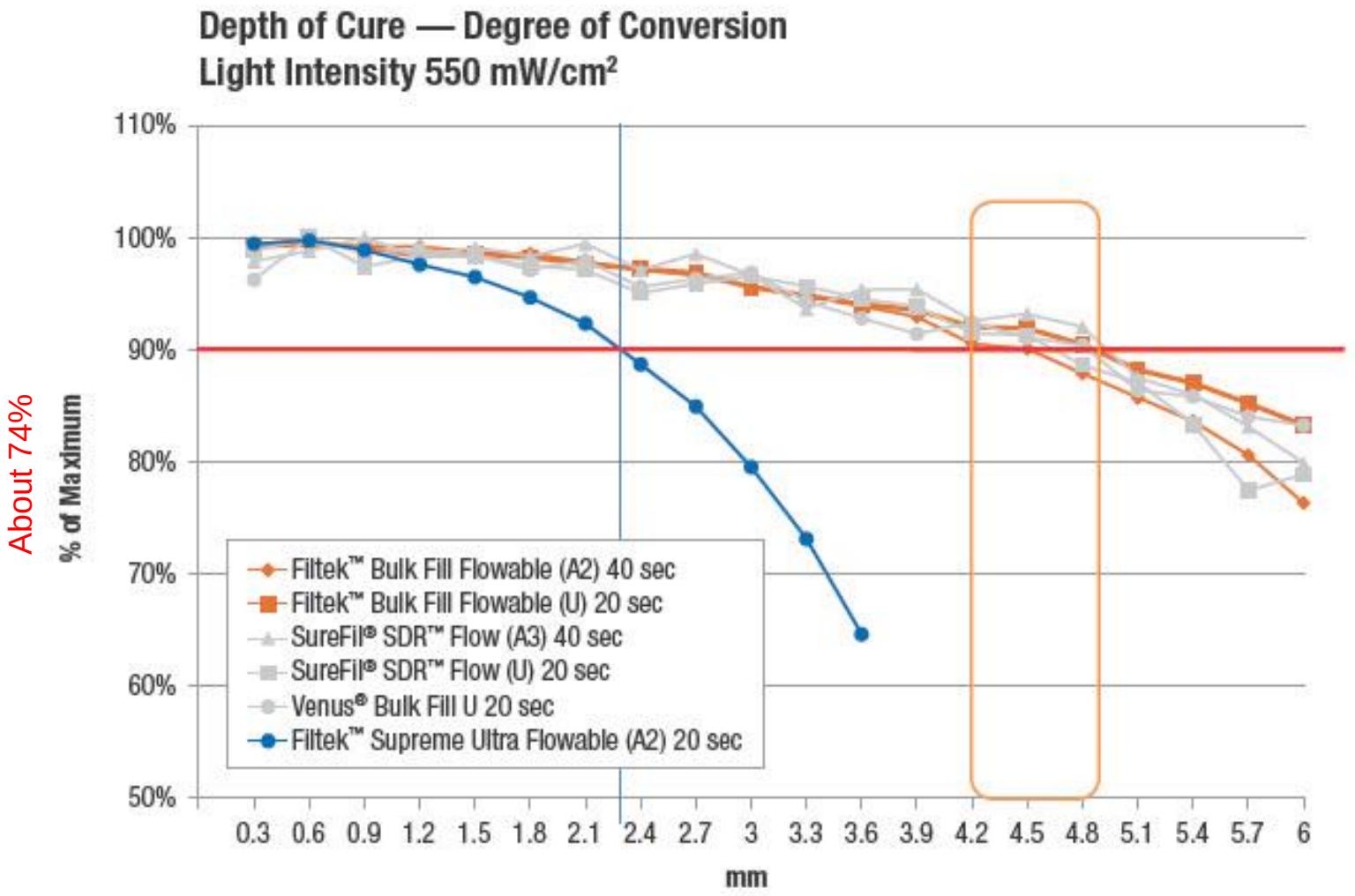




Raman spectroscopy
To determine DC.
Remember, 75% is about the maximum.

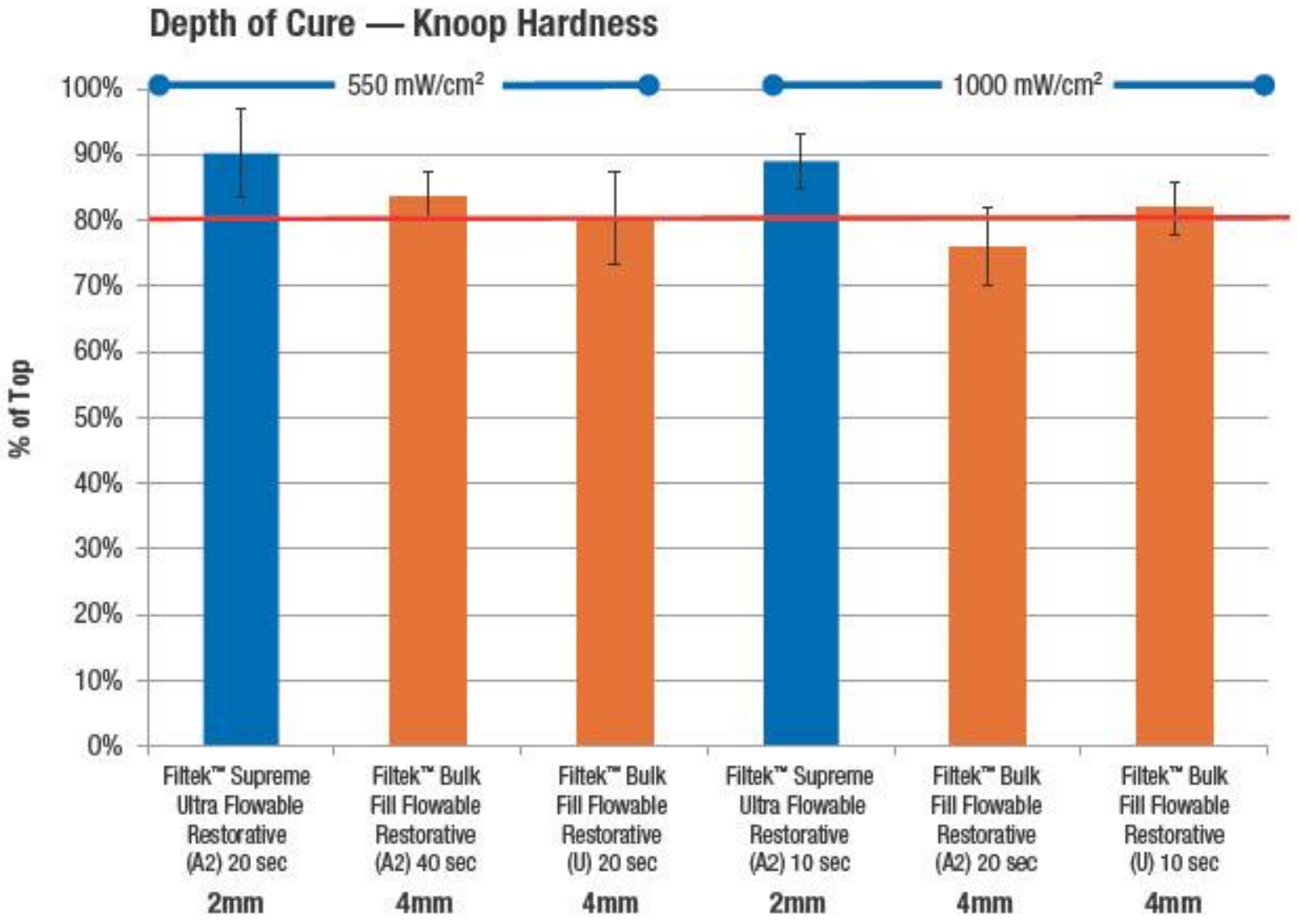
Ever wonder where “WE” came up with 2 mm for each increment?

Bulk Filled Composites



About 74%

Bulk Filled Composites



Bulk Filled Composites Summary

- Popular. But not well-researched
- Confusion/disagreement exists on how to test
- Possible because of high stress-relieving flow prior to reaching the gel point, when stresses start to build up. Low viscosity monomers are used. The 4 mm cure is due to the choice of monomers…need low viscosity (to get more filler and also flow) and high molecular weight…so BisGMA and TEGMA aren't used.
- These materials are generally less filled by volume (<50%) and shrink more, but have low shrinkage stress because of the stress relieving flow of the high amount of non-viscous monomer during curing. Remember, flowables are made of approximately 40% resin versus 20% resin in conventional composites.
- Some do demonstrate deeper curing. However, their strength is compromised due to low filler so most recommend a top layer of conventional composite…so it's actually a two-step procedure anyway!!!
- **Most manufacturers state that this is NOT a single, total restorative material for posterior restorations in occlusion.**

CROWN SYSTEMS

- Base Metal alloys—Chrome-Cobalt, Nickel Chromium, cast titanium (US dentists use foreign labs 15-20%!)
- Noble Metal Alloys—resistant to oxidation, tarnish, corrosion and biocompatible. They are ductile and malleable, cast well, finish and polish well. Noble metals are generally Au, Pt, Pd. A "gold" crown is usually an alloy of Au- Ag-Pt or Au-Cu-Ag-Pd . (types I-IV). Most dentists say if they needed a molar crown they would want gold…
- For PFM metals, the noble metals are usually Au-Pt-Pd or Pd-Ag with some Indium added to make an oxide layer to bond the porcelain
- **Non metal crown systems**

This is where it's at!

1908



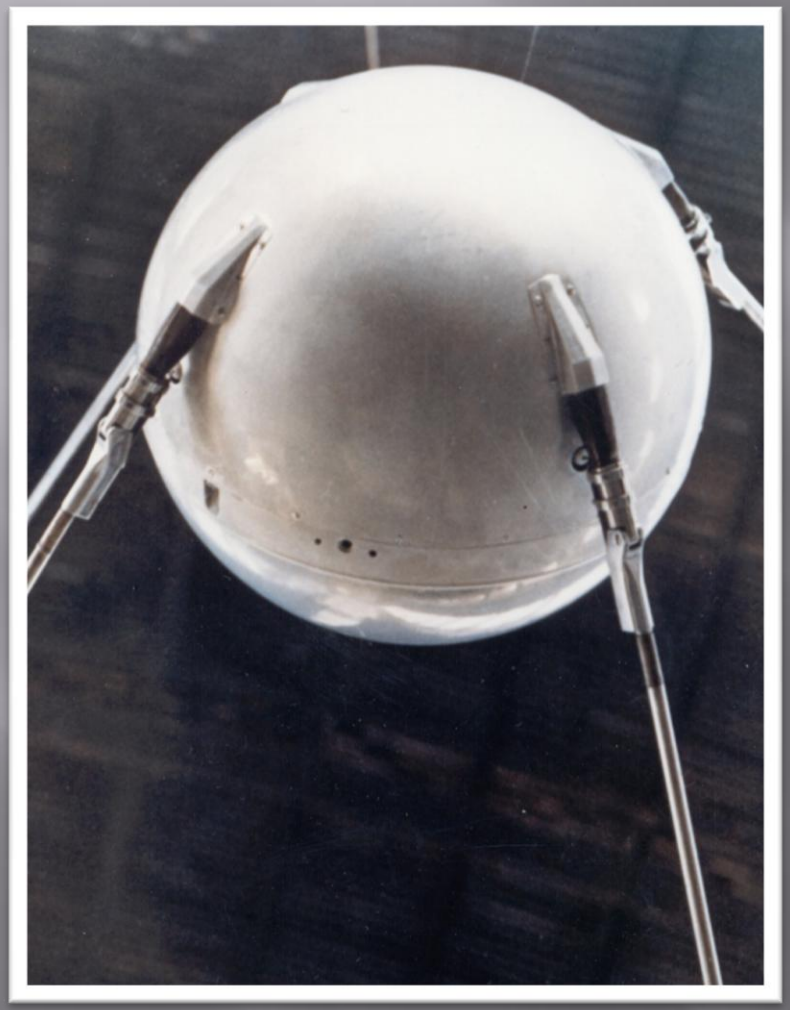
Ford Model T rolls out on production

Cast gold alloy restorations introduced to dentistry



1958





Sputnik launched

Porcelain Fused to Metal crowns introduced to dentistry



Fixed Prostheses Materials Trends

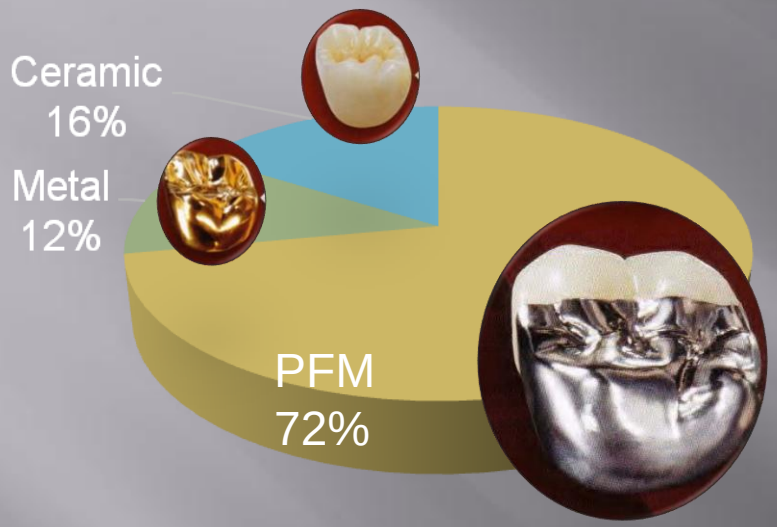
- PFM most popular indirect restoration in US* in 2007 with 61% of all fixed prostheses.

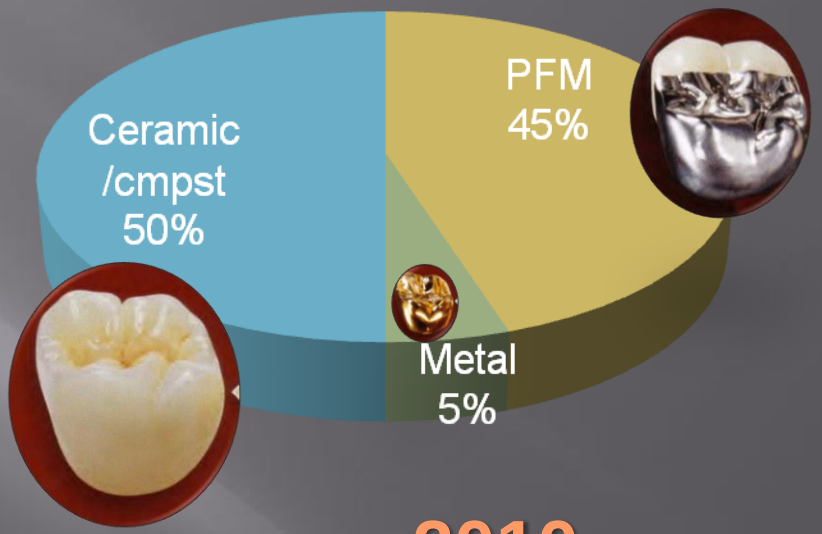


PFM drops to 45% by 2010 and less than 10% in 2013!

* Glidewell Laboratories, Newport Beach, CA, 2007, 2010, 2012 and 2013.

Usage Trends





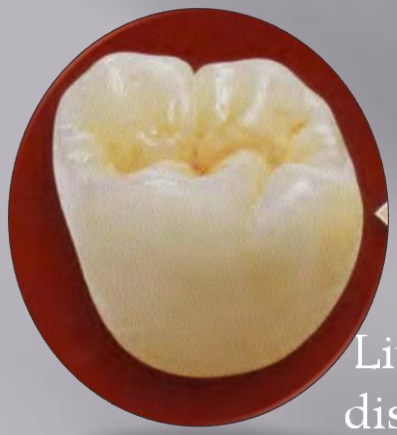
1997



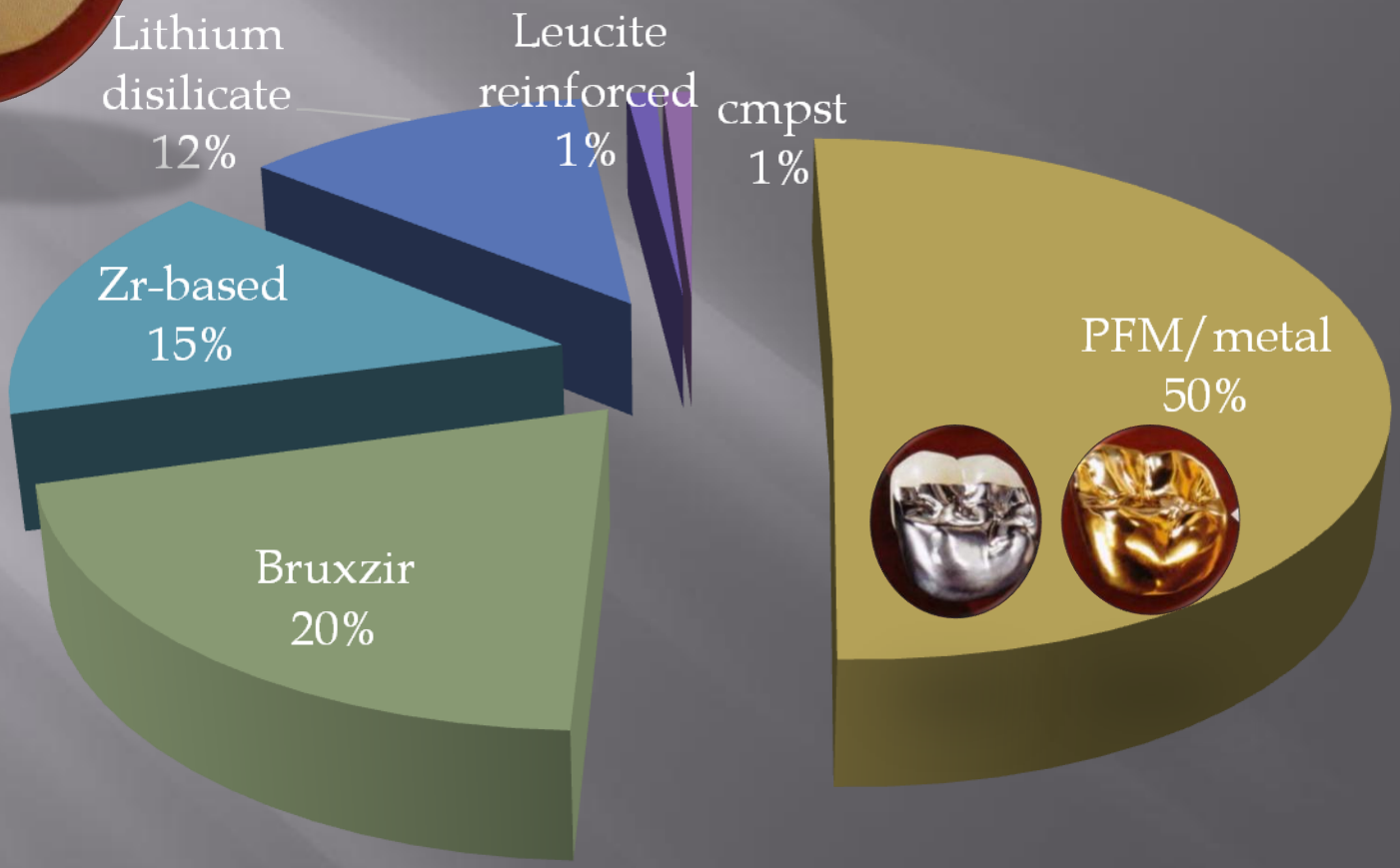
2010



Data from Glidewell Laboratories, Newport Beach, CA



Non-Metal Crowns



2010 Data from Glidewell Laboratories, Newport Beach, CA 2010

US trends in FPD's

- Data from a very large US laboratory:

PFM*	49,747	67.8%
Full contour Zirconia**	20,896	28.5%
Full contour Zr w/ cutback	0	0%
Emax CAD	0	0%
Emax Press***	2,731	3.7%

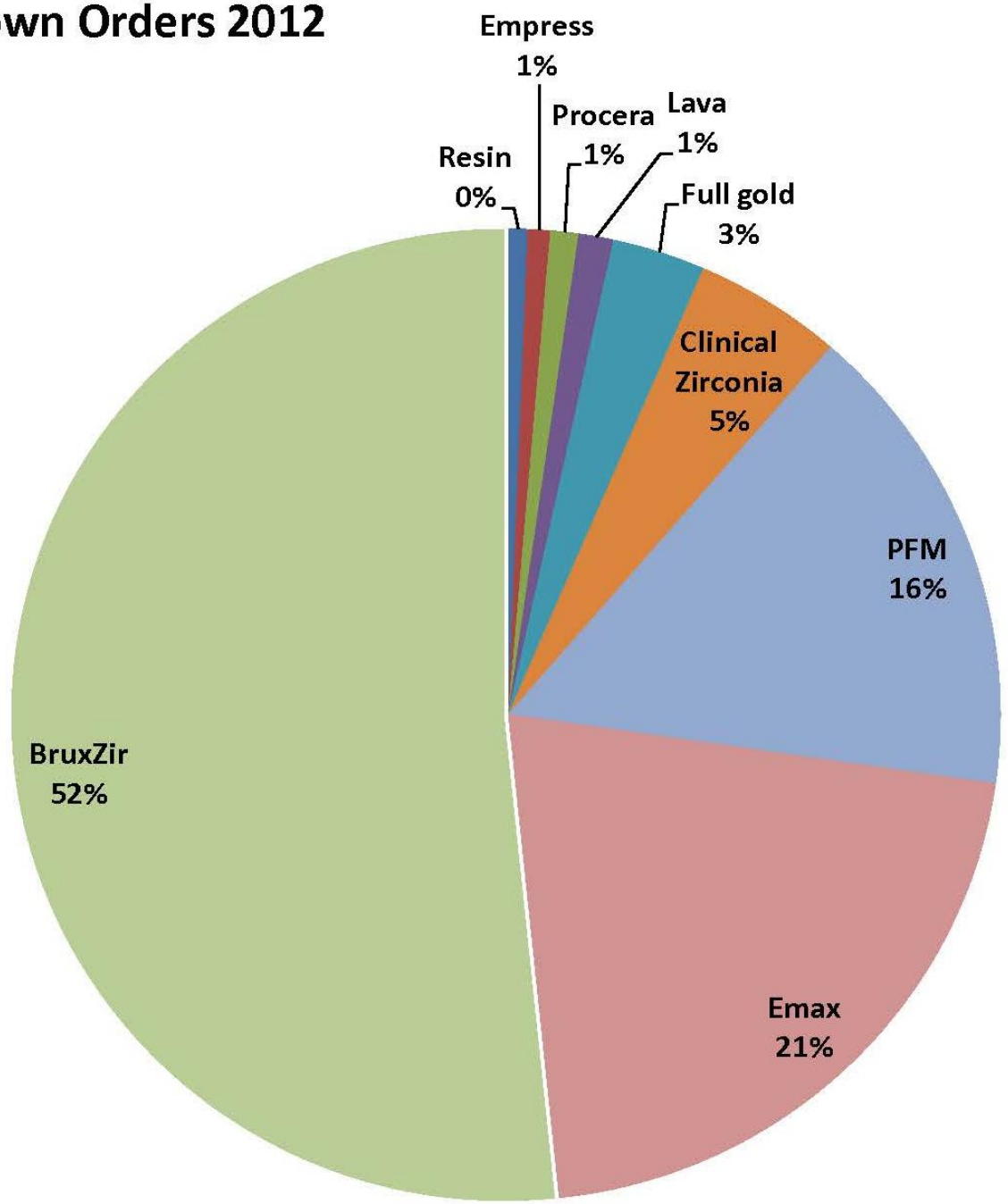
* If Bruxzir 61% are posterior, 39% are anterior
** If PFM 43% are posterior and 57% are anterior
*** If Emax, 100% are anterior

Glidewell Dental Laboratories, personal communication, 2011

Non-metal Crown Choices

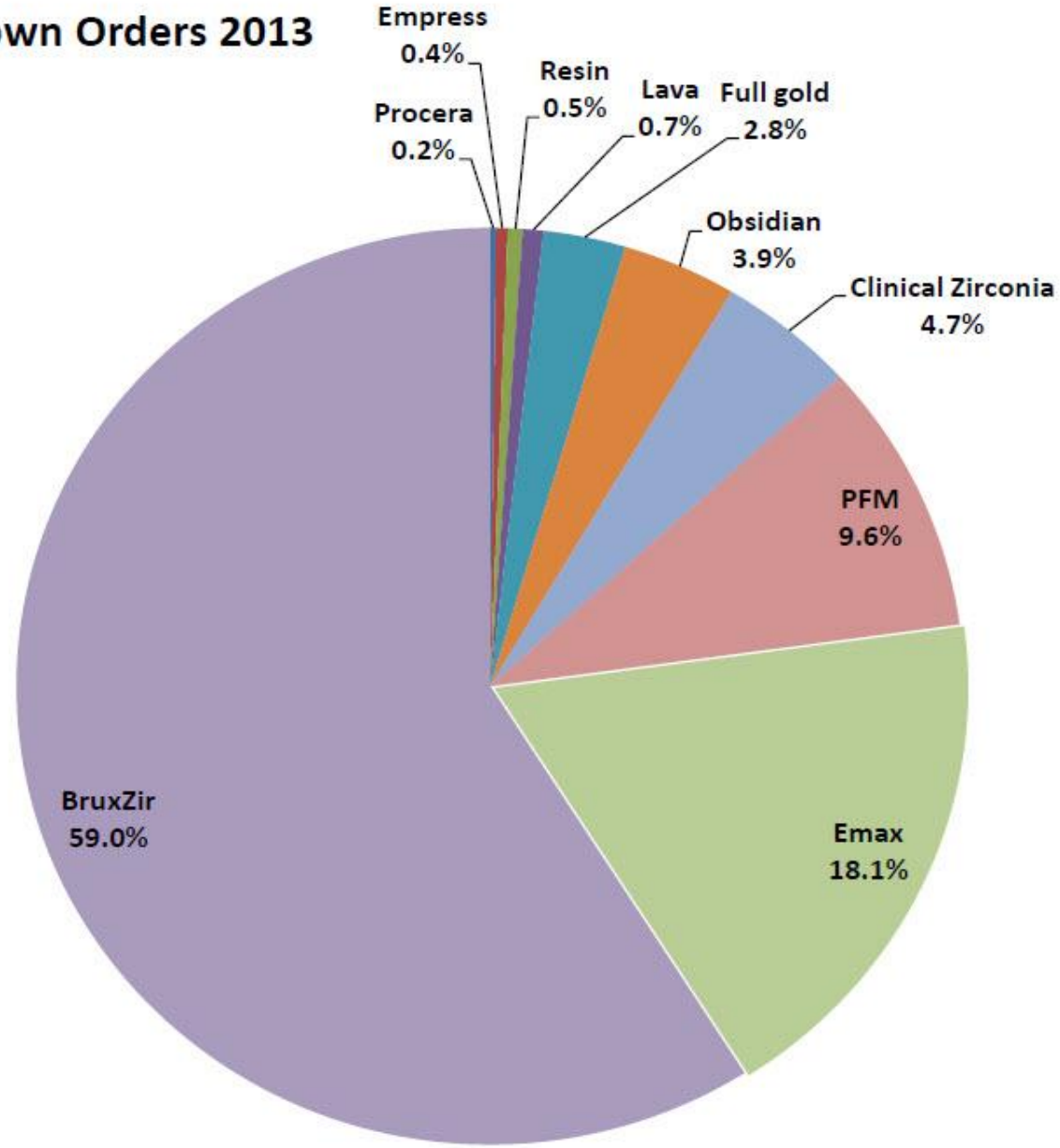
- Zirconia-based: Lava, Cercon, Everest
- Full Contour Zirconia: Bruxzir
- Leucite Reinforced Feldspathic: IPS Empress, Authentic, Finesse
- Lithium Disilicate: IPS Emax, CAD/Press
- Aluminum Oxide: InCeram, Procera, AllCeram
- Feldspathic (veneers)
- Polymer-based: belleGlass, Sinfony, Artglass, Sculpture-Fibrekor, Cristobal
- CAD/CAM: Sirona CEREC, E4D—can mill almost anything (can it mill a gold crown better than casting?) Lava Ultimate
- Resin-based nano ceramic CAD/CAM crowns—Lava Ultimate, Vita Enamik, Vita Suprenity—THESE DO NOT REQUIRE ANY OVEN TIME

Non-Splinted Crown Orders 2012



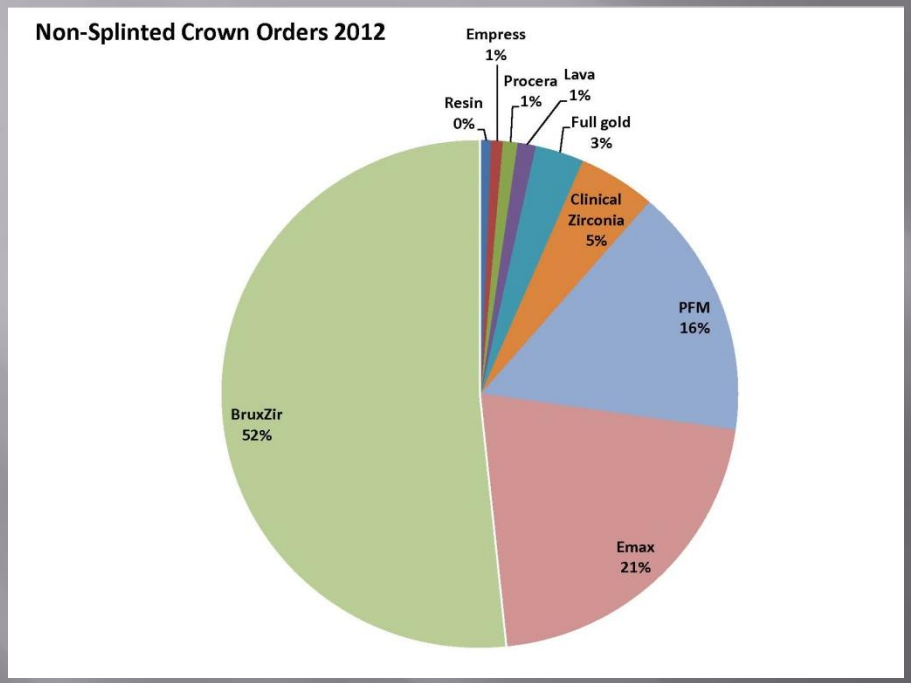
From: Glidewell Laboratories, August 2012

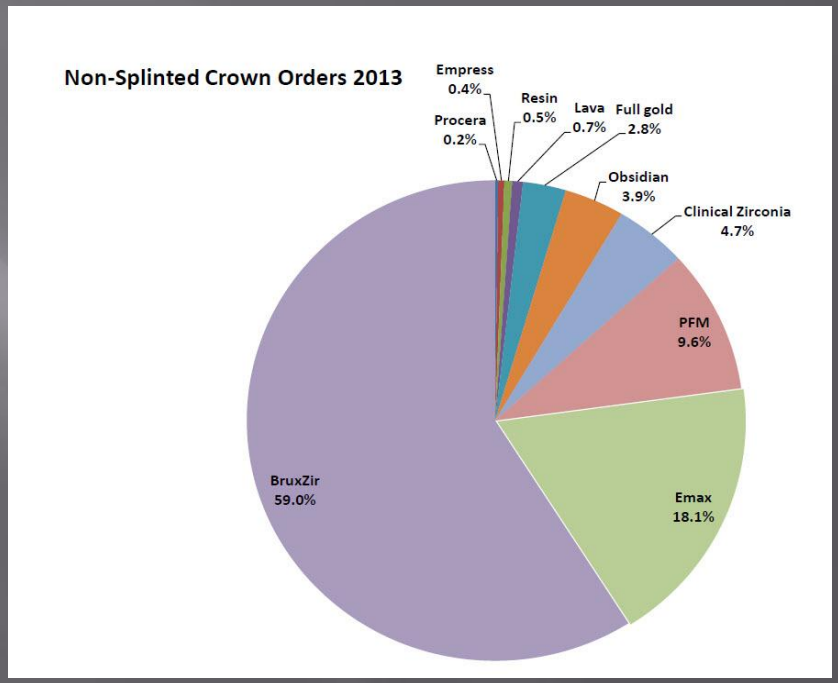
Non-Splinted Crown Orders 2013



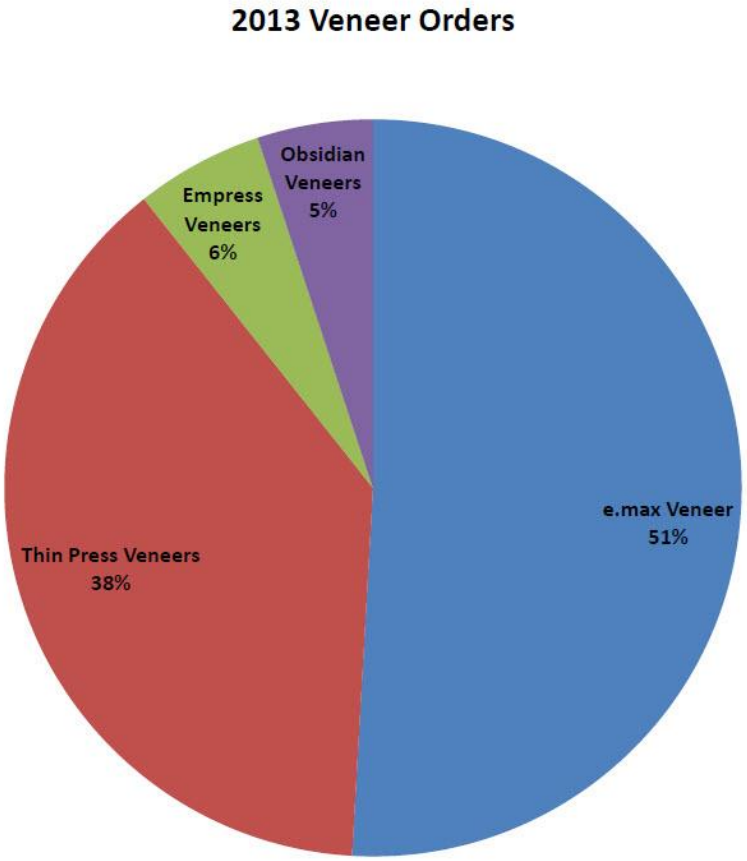
From: Glidewell Laboratories, July 2013

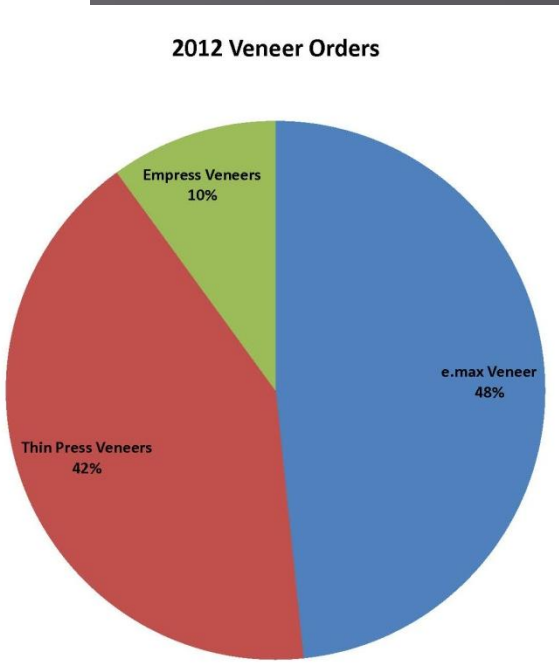
COMPARISON 2012 to 2013



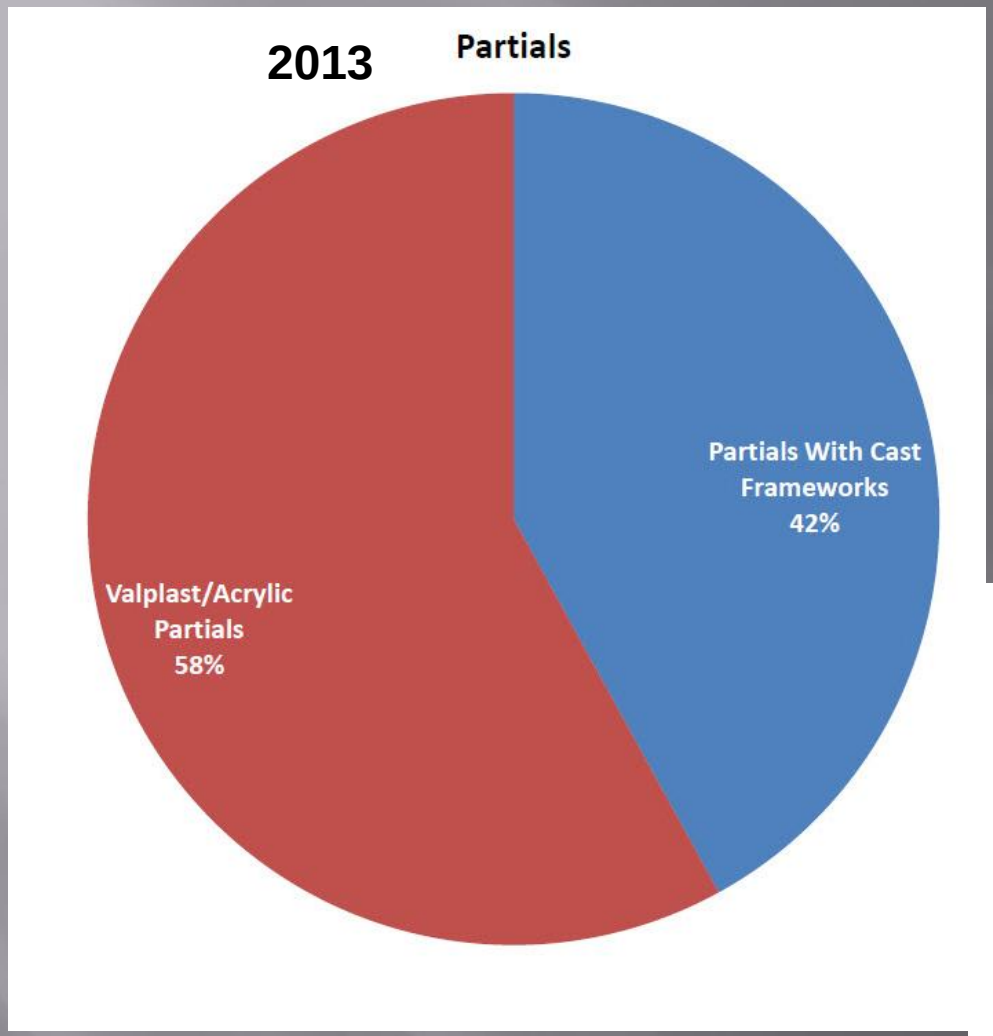


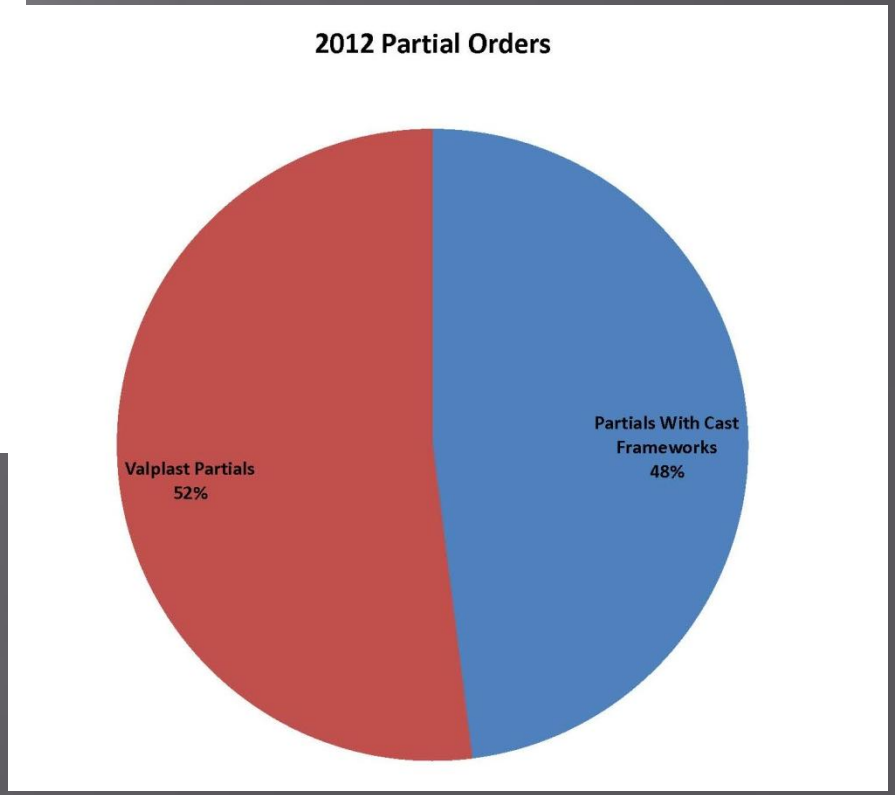
BruxZir single unit restorations up from 52% to 59%
PFM down from 16% to less than 10%
Emax steady at around 20%
Resin-based nanoceramic CADCAM crowns still not popular, less than 1% made by a lab…But they are intended to be made chairside with no oven time…





From: Glidewell Laboratories July 2013





From: Glidewell Laboratories, July 2013

Resin	0.6%
Empress	0.7%
Procera	0.9%
Lava	1.1%
Full gold	3.1%
Clinical Zirconia	4.9%
PFM	15.9%
Emax	21.1%
BruxZir	51.6%

96% of our veneers are hand waxed and pressed

e.max Veneer	48.3%
Thin Press Veneers	41.6%
Empress Veneers	10.0%

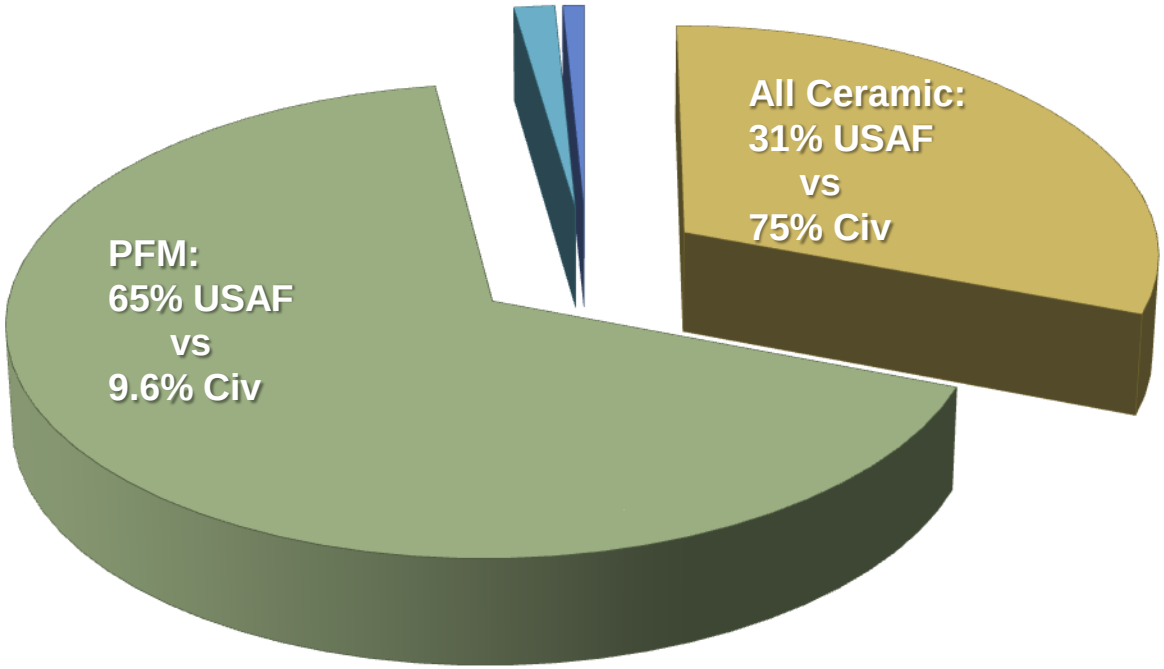
Acrylic Metal Partials	41%
Valplast Metal Partial	
All Valplast Partial	

Partials With Cast Frameworks	
Valplast Partials	

From: Glidewell Laboratories, August 2012

Single Unit Crowns

USAF DATA



- D2740 Porcelain/Ceramic Substrate
- D2750 PFM High Noble Metal
- D2752 PFM Noble
- D2792 Full Cast Noble Metal

Source: USAF Dental Service Report FY 2012

Full Contour Zirconia (59% of all crowns in 2013)



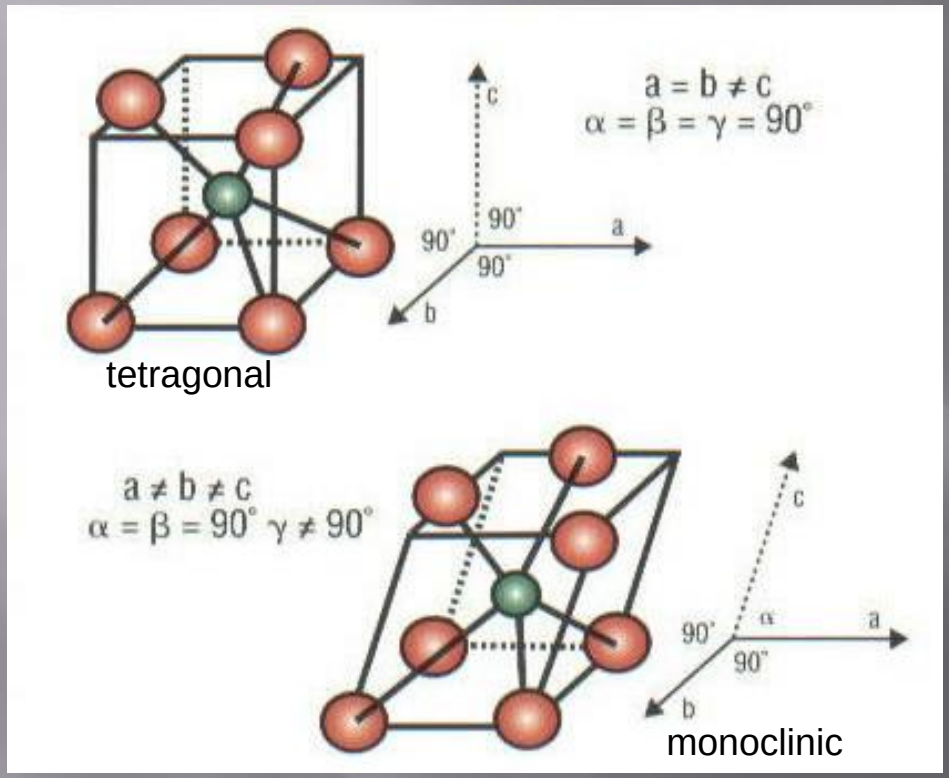
Technicians kept getting under-prepared teeth and started making full zirconia restorations….

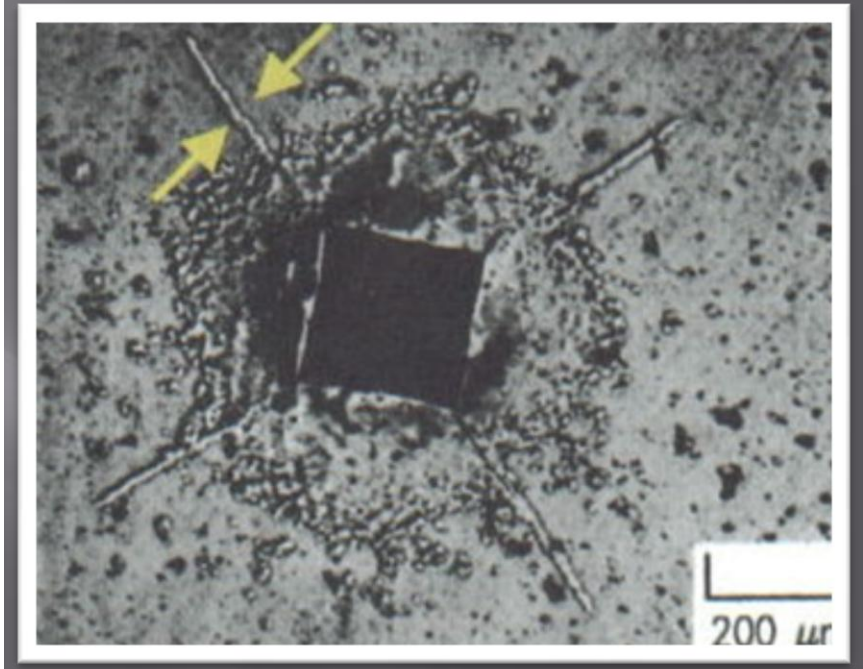
Small grained ZR, when Well polished, appears to have acceptable wear

There are over 130 authorized Bruxzir laboratories in the US*

*from ADA News ad, November 7, 2011, Vol 42, No. 20.

Why (how) Zirconia Works





Great potential for chairside restorations—no staining, glazing, or waiting on an oven.

Dental Products

Products
- Product Catalog
- Techniques and Solutions
- Brands You Trust
- Where to Buy 3M ESPE Dental Products
- Find an Authorized Lab

Promotions
- Special Offers
- Sign Up for 3M ESPE E-mail
- Digital Dentistry Newsletter

What's New
- New Dental Products
- News Articles
- Press Releases
- Upcoming Events

Resources
- Literature
- MSDS/Product Safety

Education
- Online Dental CE Courses
- Scientific Resources

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- About Us
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Lava™ Ultimate Restorative

You'll love this breakthrough CAD/CAM material.

Resin nano-ceramic

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Overview | Features and Benefits | Clinical Cases | CAD/CAM Systems | Ordering Information



Use it anywhere you'd use glass ceramic – only with more confidence.

More Information

- CDT Code Reimbursment (PDF, 18KB)
- Brochure for Doctors (PDF, 1.1MB)
- Flyer for Doctors (PDF, 1.1MB)
- Brochure for Dental Labs (PDF, 1.5MB)
- Brochure for CEREC® (PDF, 466KB)
- Brochure for E4D (PDF,

New CAD/CAM Blocks



- Lava Ultimate 3M
- Dentsply Celtron
- Vita Enamik-hybrid ceramic polymer
- Vita Suprenity-Zr/Li Silicate
- Ivoclar Blue Block-E Max CAD



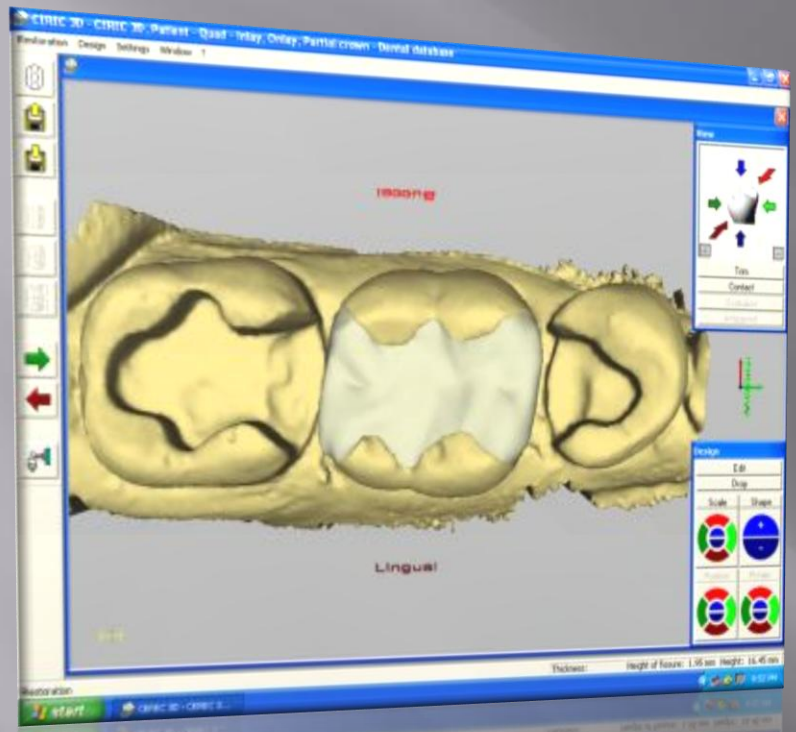


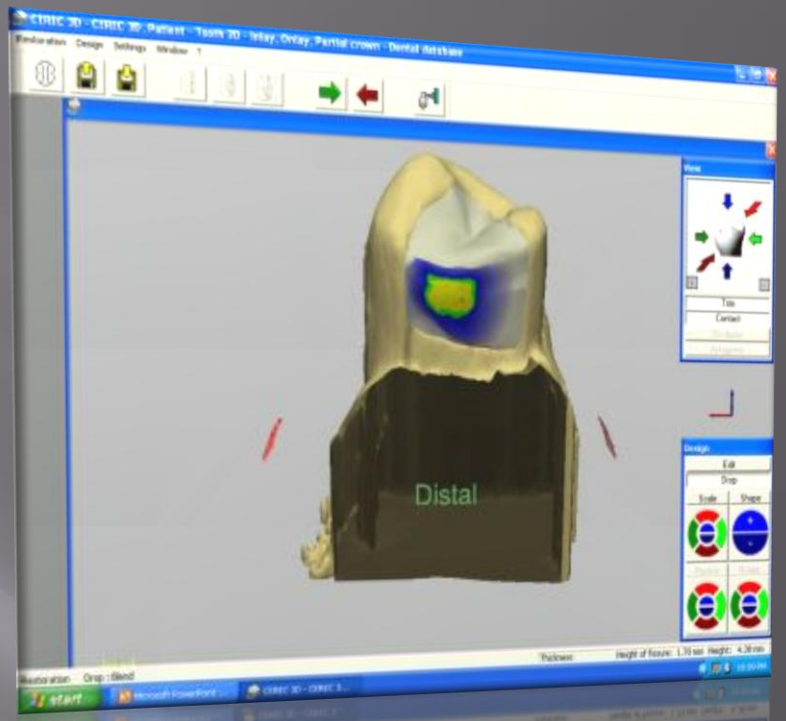


Blocks have the advantage of superior manufacturing—heat and pressure
Better physical and mechanical properties
Fewer flaws = less cracks, newer systems have toughening mechanisms
Degree of polymer conversion is 100% (versus 60-75%)
Newest systems incorporate Zr into resin nanoparticles

CAD/CAM


CEREC
4.0
CEREC® AC
CAD/CAM FOR EVERYONE
CEREC
Dentist
THE DIFFERENCE IN DENTISTRY


Lingual


Distal

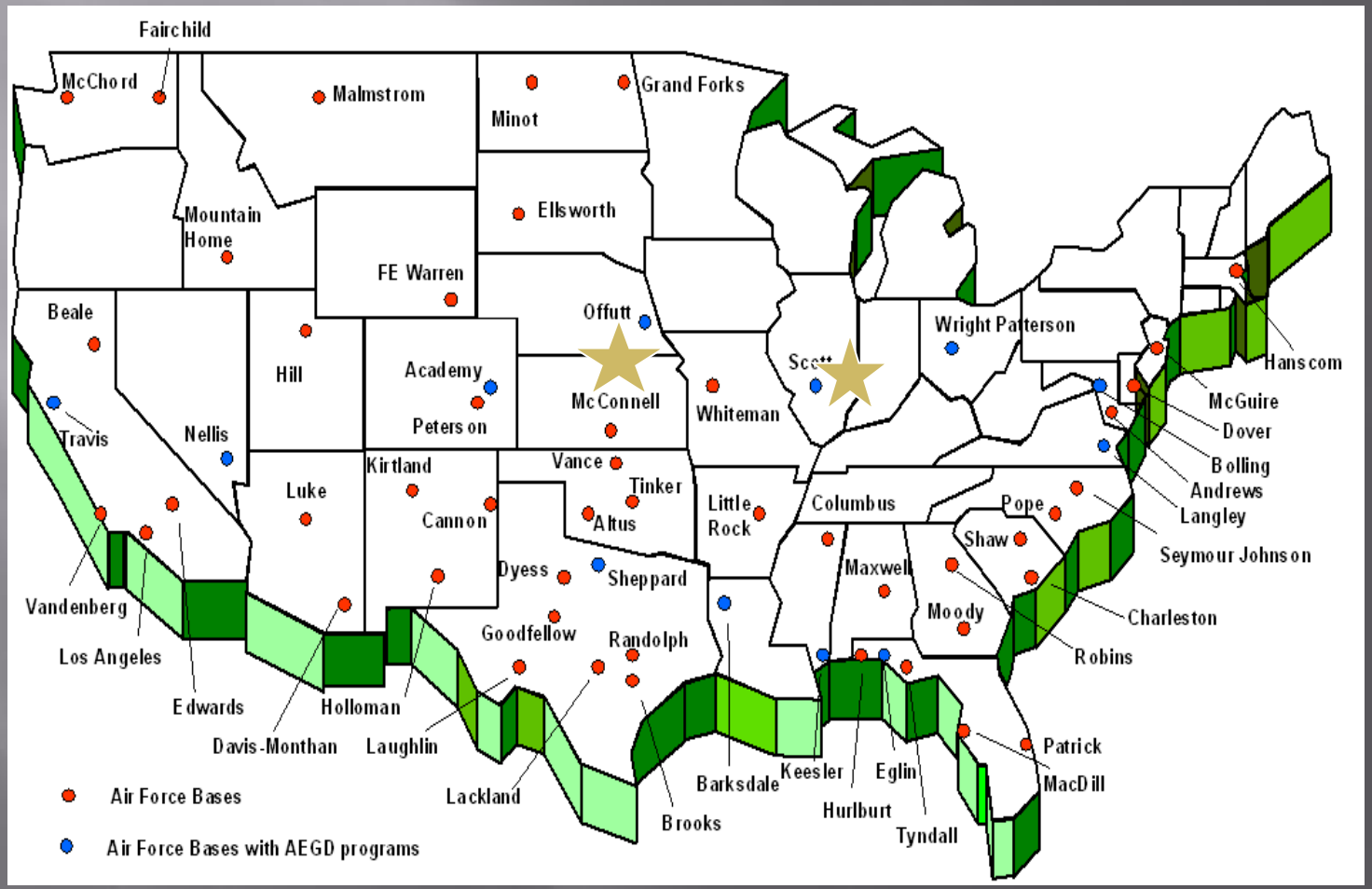




Air Force Implementation (2008)

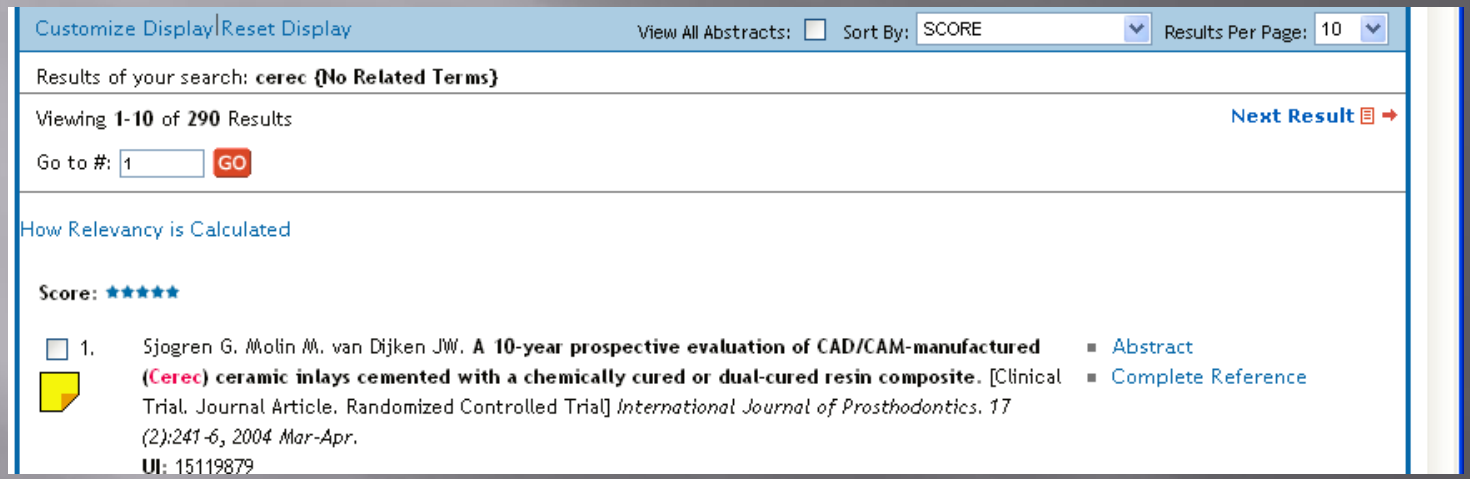
- April 2006 central purchase
- McConnell AFB 1st with InLab system
- Scott AFB 1st* chairside unit

#cerec units (20) X 100 = **24%**
total AF bases (78)



CEREC Literature

- Ovid 290 results for CEREC (2008), 432 in 2011
- PubMed 349 results for CEREC (2008), 457 for CAD/CAM



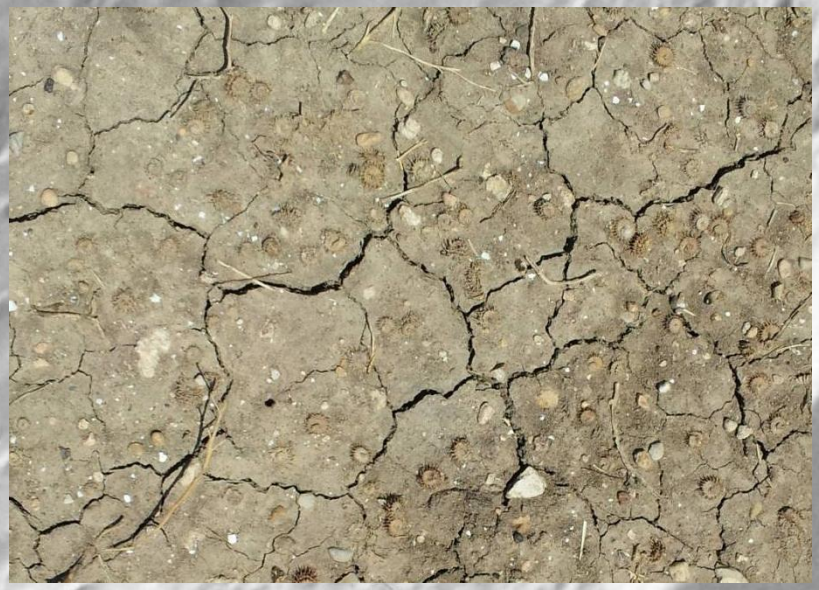


CEREC Literature
Clinical Studies

- Most based on earlier versions of CEREC and mostly inlays
- Systematic review of 15 clinical studies revealed high success rates—97.4% over 4 years (Otto T, De Nisco S. *Int J Prosthodont* 2002;15:122-8.)
- Prospective 10-year survival rate of 89% (Sjogren *et al. Int J Prosthodont* 2004;17:241-6.)
- 2,329 inlays and onlays in 794 patients, 95.5% survival after 9 years (Posselt and Kerschbaum, *Int J Computer Dent* 2003;6:231-48.)
- Clinical performance of adhesively placed CEREC crowns—after 1 year all 20 crowns were clinically acceptable (Otto T. *Int J Periodontics Restorative Dent* 2004;24:446-55.)
- Review of studies from 1985-2006, survival rate was 97% for 5 years, 90% for 10 years (Fasbinder DJ, *J Am Dent Assoc* 2006 Sep; 137 Suppl;22s-31s)
- In vitro study on marginal and internal fir of CAD/CAM all-ceramic crowns. Marginal gap was 42-56 microns. (Nakamura et al. *Dent Mater J* 2005 Sep;24:456-9.)

CEREC Literature

- Independent in vitro investigations report an average margin of 50 microns (Martin N and Jedynakiewicz NM. *Dent Mater* 2000. 16:68-74).
- According to Siemans-CEREC Research and Development Team, maching accuracy is between 50 and 60 microns at the margin.
- Mormann and Schug (JADA 1997) reported a mean marginal accuracy of CEREC inlays of 56 microns.
- Northeast *et al (Br Dent J 1992)* demonstrated that few commercial laboratories were able to produce restorations with margin adaptation better than 56 microns.
- Dunn WJ wasn't able to get better than 80 microns (range 42 – 139 microns) in his pilot research.

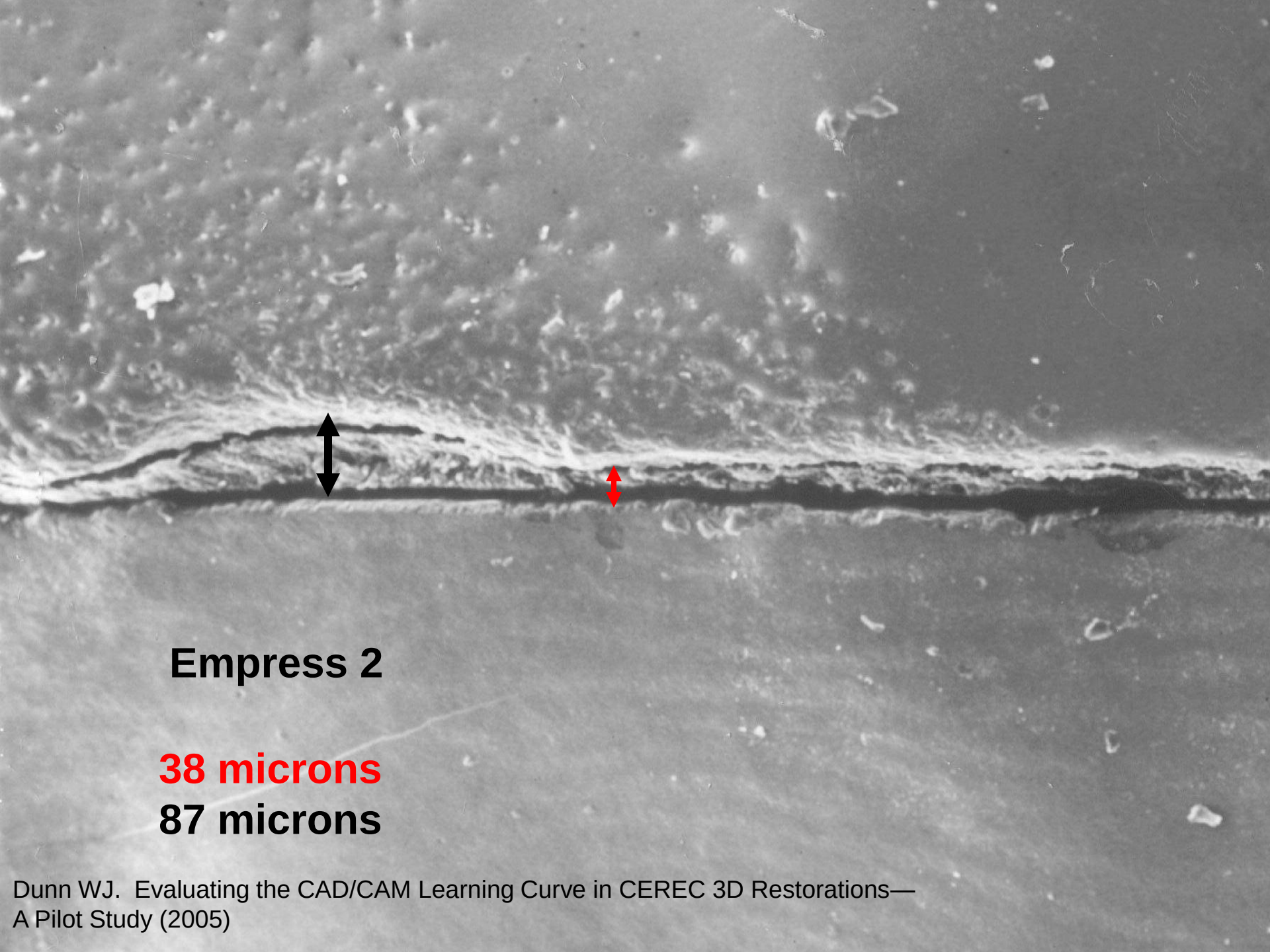


CEREC

42 microns

139 microns

Dunn WJ. Evaluating the CAD/CAM Learning Curve in CEREC 3D Restorations—A Pilot Study (2005)



Dunn WJ. Evaluating the CAD/CAM Learning Curve in CEREC 3D Restorations—A Pilot Study (2005)



All research was suspended. 196 studies were closed.
But worse, 1,836 people lost their lives and almost every person living on the coast was forever affected.

Did Not Finish the Same Day

- 69 out of an AF total of 135, 51%
- 28 of these became PFMs
- Reasons:
  - Software problems
  - Missing supplies
  - Problem reading optical margins
  - Steep learning curve
  - Took too much time (4 hrs +)
  - Crowns cracked at delivery
  - Crowns fx after a short time

Overall Impression

- Ordinal scale from 1 (dissatisfied) to 5 (very pleased), with 3 being neutral.
- Range 2 to 5 (somewhat dissatisfied to very pleased).
- Mean* 3.5 (between neutral and somewhat pleased).
- Scott AFB very pleased***remember the prosthodontist?

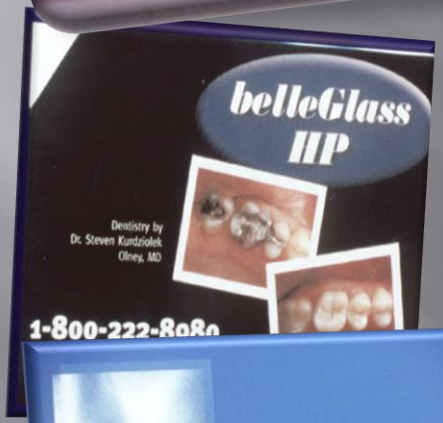
*non-parametric data shouldn't really have a mean….but you get the point

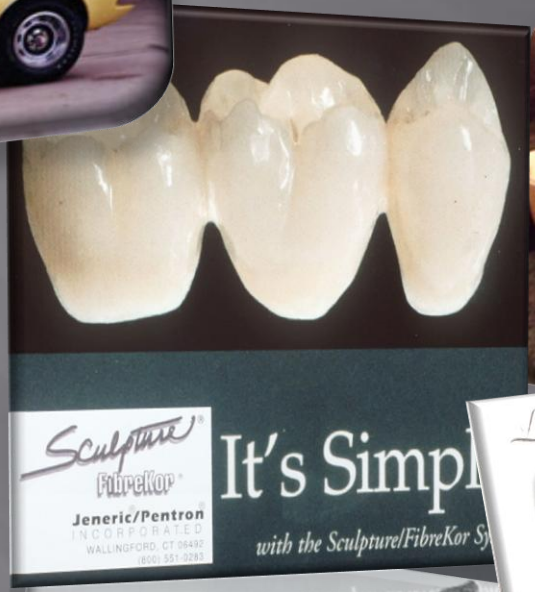
Bad Ideas



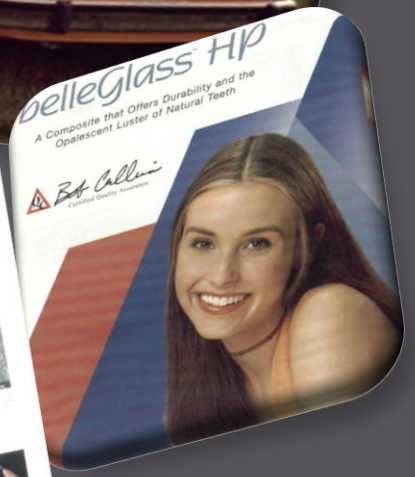


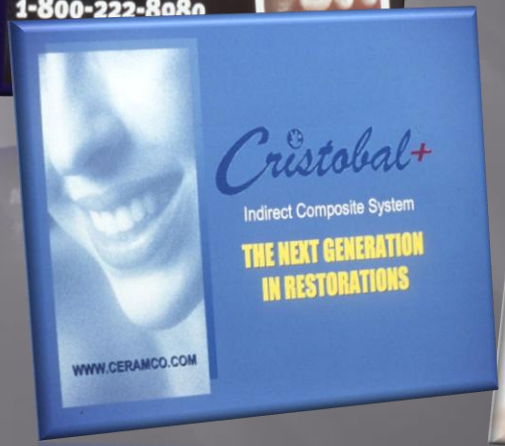



belleGlass HP
Dentistry by
Dr. Steven Kuntzlolek
Olney, MD

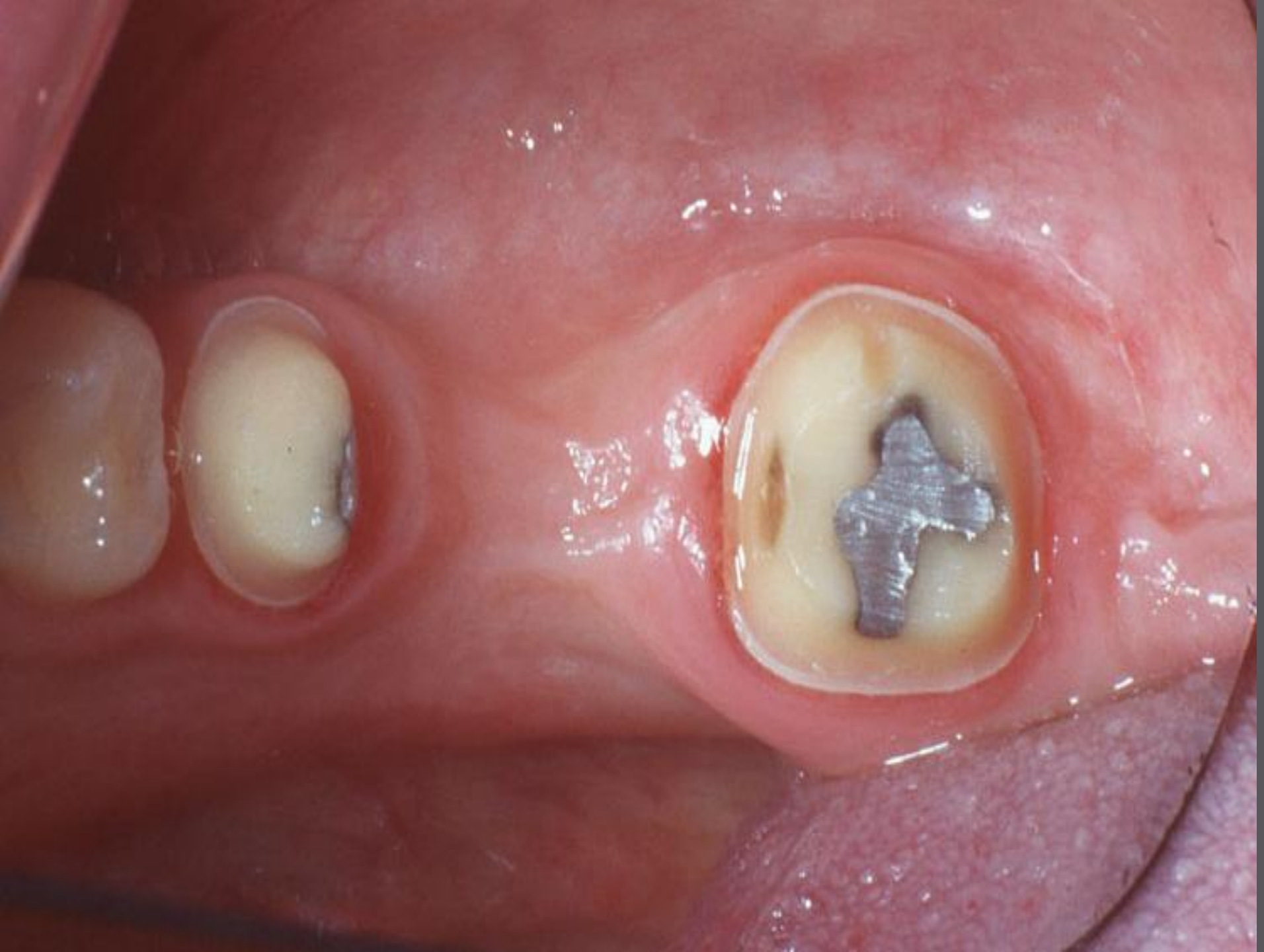

Sculpture
FibreKor
Jeneric/Pentron
INCORPORATED
WALLINGFORD, CT 06492
It's Simpl
with the SculptureFibreKor Sy


Light as a Feather
Strong as Steel
FibreKor
Sculpture


belleGlass HP
A Composite that Offers Durability and the Opalescent Luster of Natural Teeth
Bob Callan


Cristobal+
Indirect Composite System
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Light Curing Units

- Halogen (tungsten/quartz/halogen)
  - Large, corded, noisy(fan), hot, bulb degradation
  - Top picks: Optilux 501 (kerr), Demetron LC (Kerr)

- Light Emitting Diode
  - Smaller, usually not corded, quiet, cool, better prognosis when dropped
  - Top picks: Valo (Ultradent), Demi Plus (kerr), Fusion (Dentlight), Elipar S10 (3M ESPE)


The Cure-All Solution...
Demetron's New High Performance Curing Machine
HAVE YOU SEEN
THE LIGHT?
VALO is the Right Power in the Right Place
VALO
Elipar™ S10
LED Curing Light
Hold One, And You'll Want One.
3M ESPE
An extraordinary family of curing lights.
bluephase
Step up to a new class of curing lights with the bluephase G2 and bluephase 20i
ivoclar vivadent
Kerr
curing system powered by Demetron Technology
Demi Plus
FUSION™ Curing Light
The new standard in power, size and reliability
radii-cal
light on weight, radically powerful
SmartLite max
SPACE-AGE TECHNOLOGY. NEW-AGE AFFORDABILITY.
A ROBUST FEATURE SET. ALL IT NEEDS IS YOU.
radii plus
not just a powerful LED curing light
FlashMax P3
The World's Most Powerful Curing Light
MDI
1.800.392.1171
Slimax-A LED Curing Light
SUMMER • LIGHTER
Manufacturer Promotional Price
$299.00/each
Retail Price: $599*
2000mW/cm²(±10%)
Polymerizes all composite types
Full, Ramp and Pulse modes
Four colors: silver, pink, blue, purple
Two Years warranty
Top Selling in Canada.
Every dentist should have one!
Beyes

Both use electrical energy to heat a tungsten filament.

Both have a noisy cooling fan.

The QTH light filters out all other wavelengths of the light created by the glowing filament except for blue.





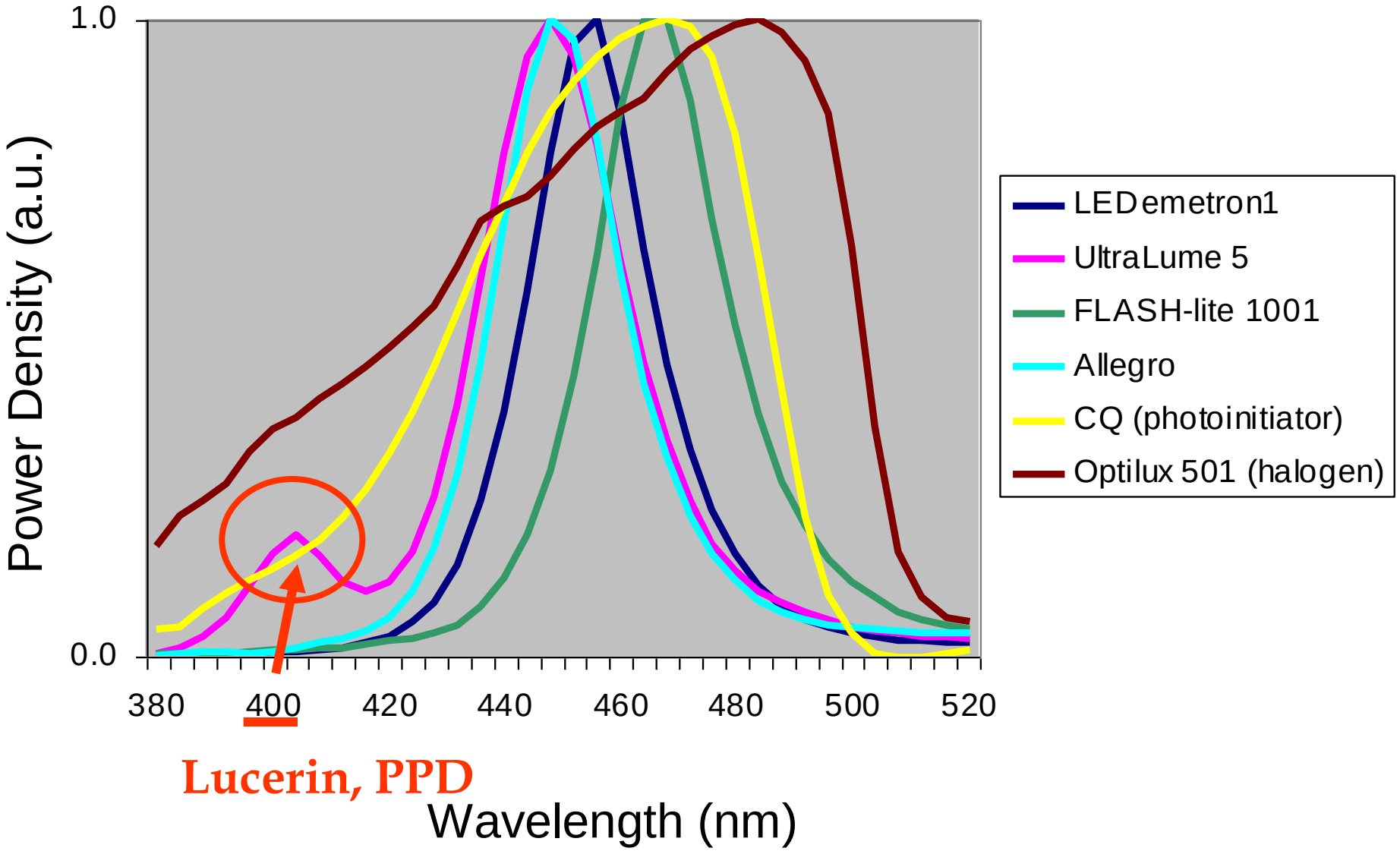
Commercially Available Light Emitting Diode Curing Units (2001-2004)



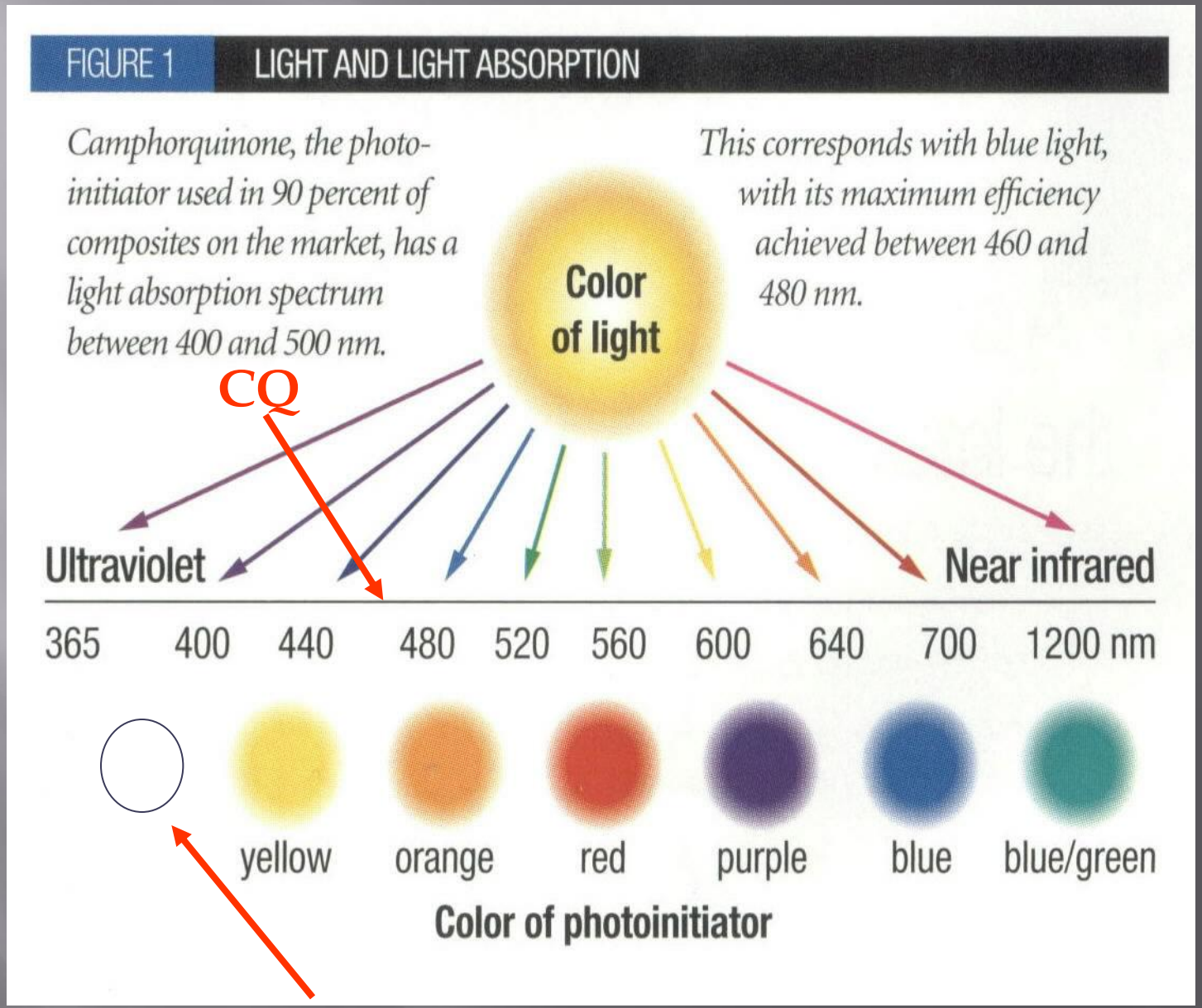
Adequacy of LED output? (2002)

- Commercially available LEDs produce an output of 150-400 mW/cm^2 (in 2001, most not on market today)
- However, the absorption spectra for LEDs is closer to the absorption maximum of camphoroquinone (468 nm), so you may get "more bang for the buck".
- Still, the commercially-available LEDs were not able to cure composites as well as halogen-based lights.*
- Newer generation (2003-4) probably adequate. These include Ultralume 2 & 5, Allegro, LEDemetron, IQ Light.
- Newest generation (2011) are excellent

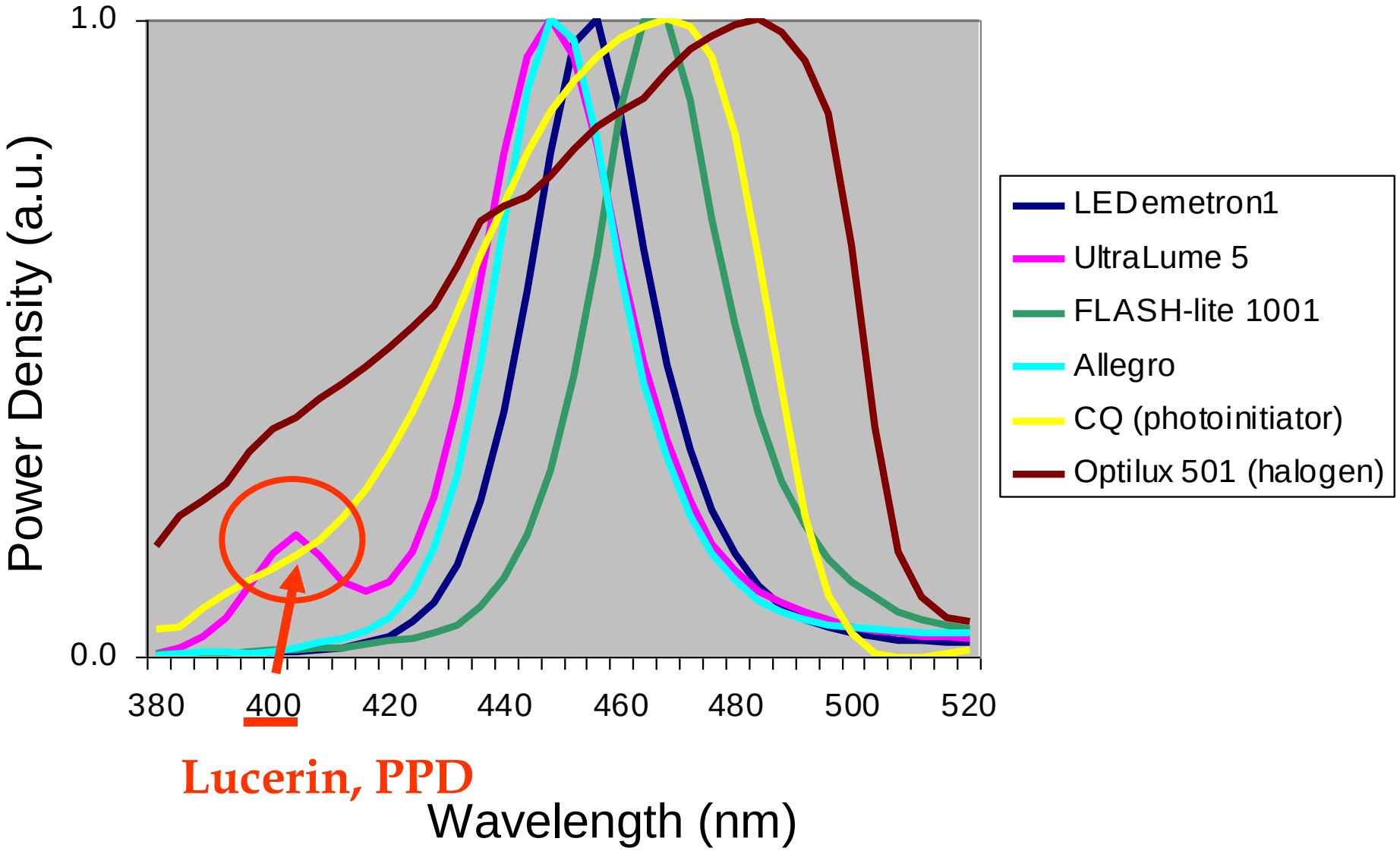
**Dunn WJ & Bush AC. JADA 2002:Vol. 133(3)*



Andrus, Dunn & Vandewalle, 2004

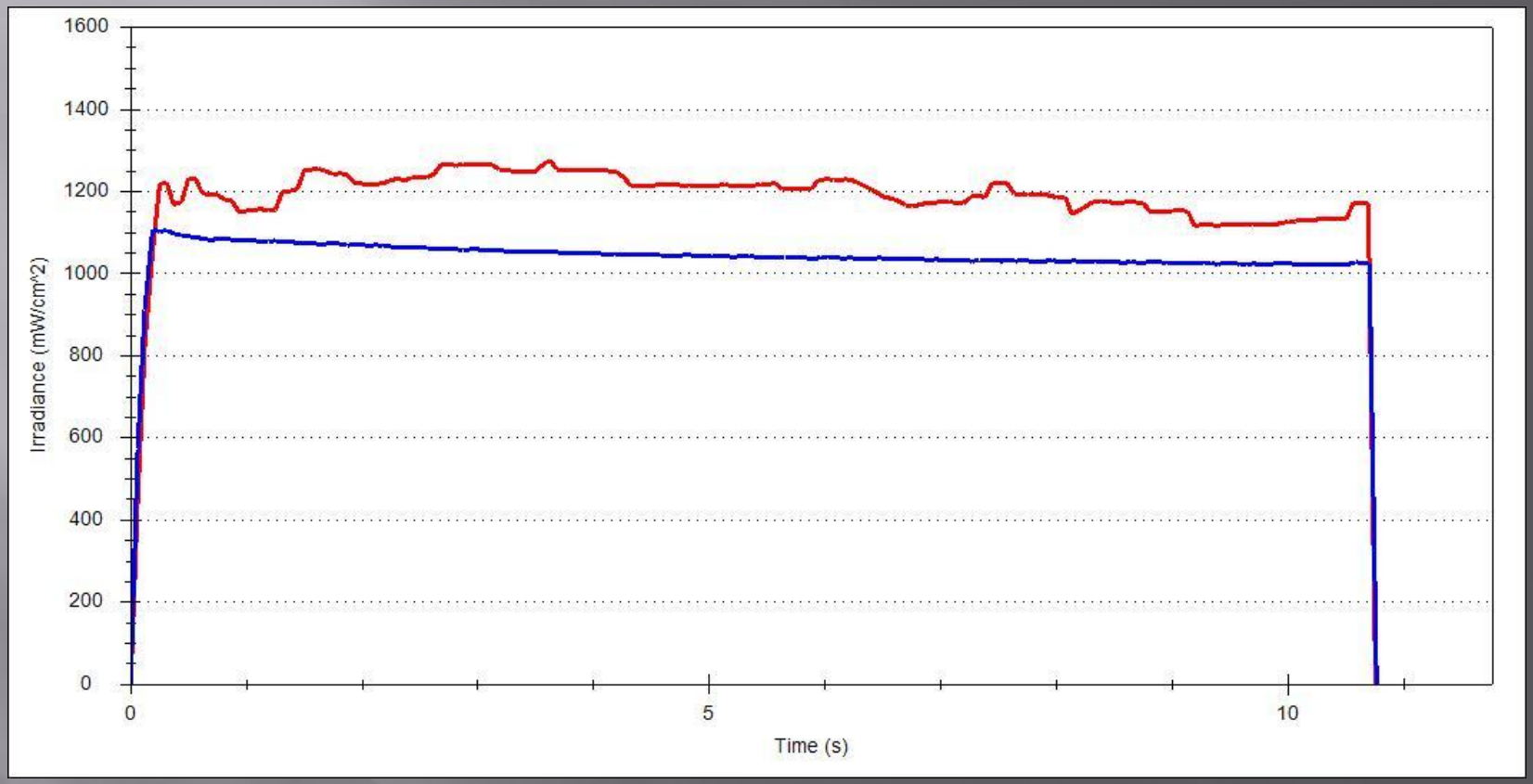


Phenylpropanedione (PPD) Lucerin

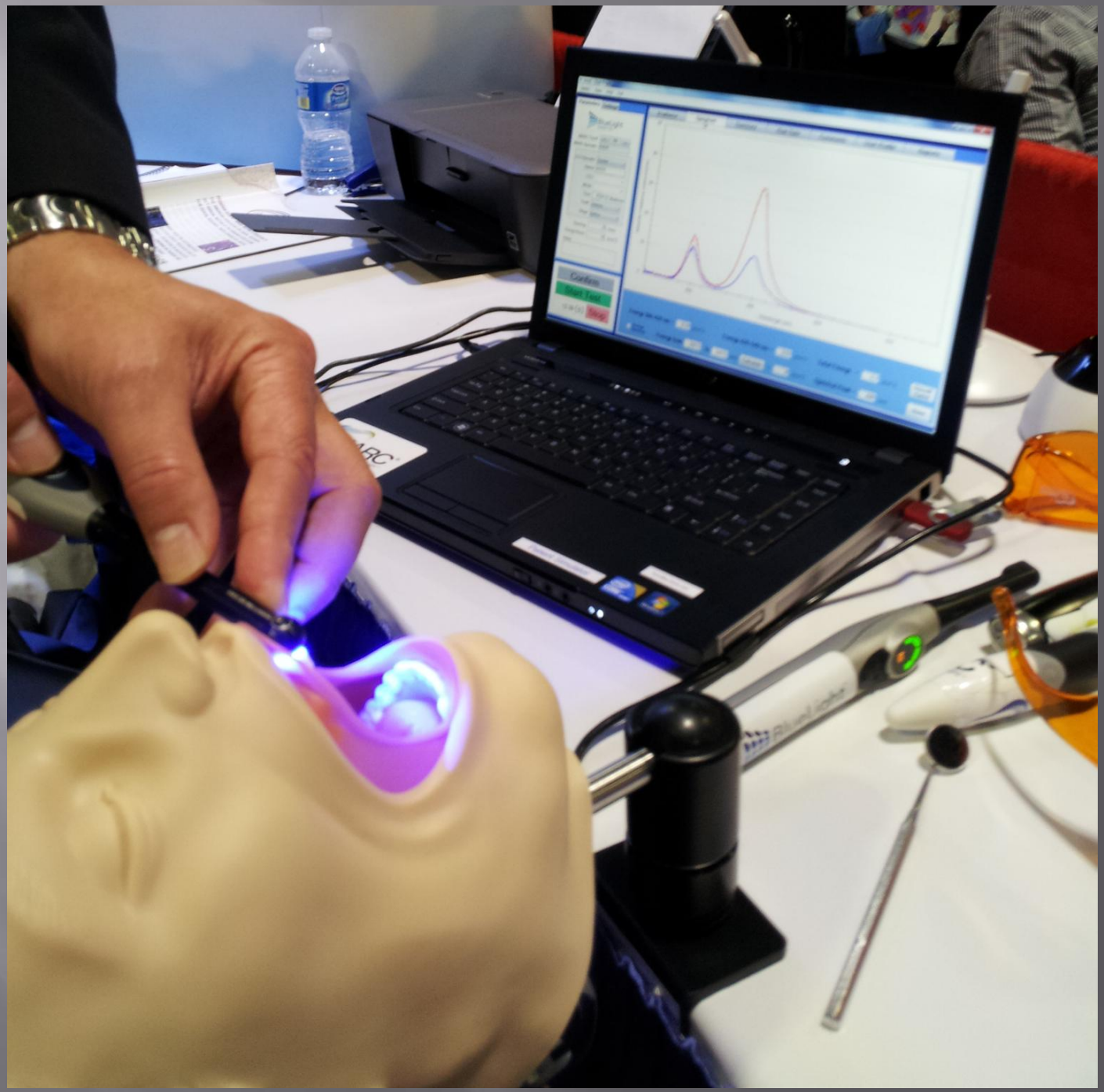


Andrus, Dunn & Vandewalle, 2004

Factors which could influence photopolymerization



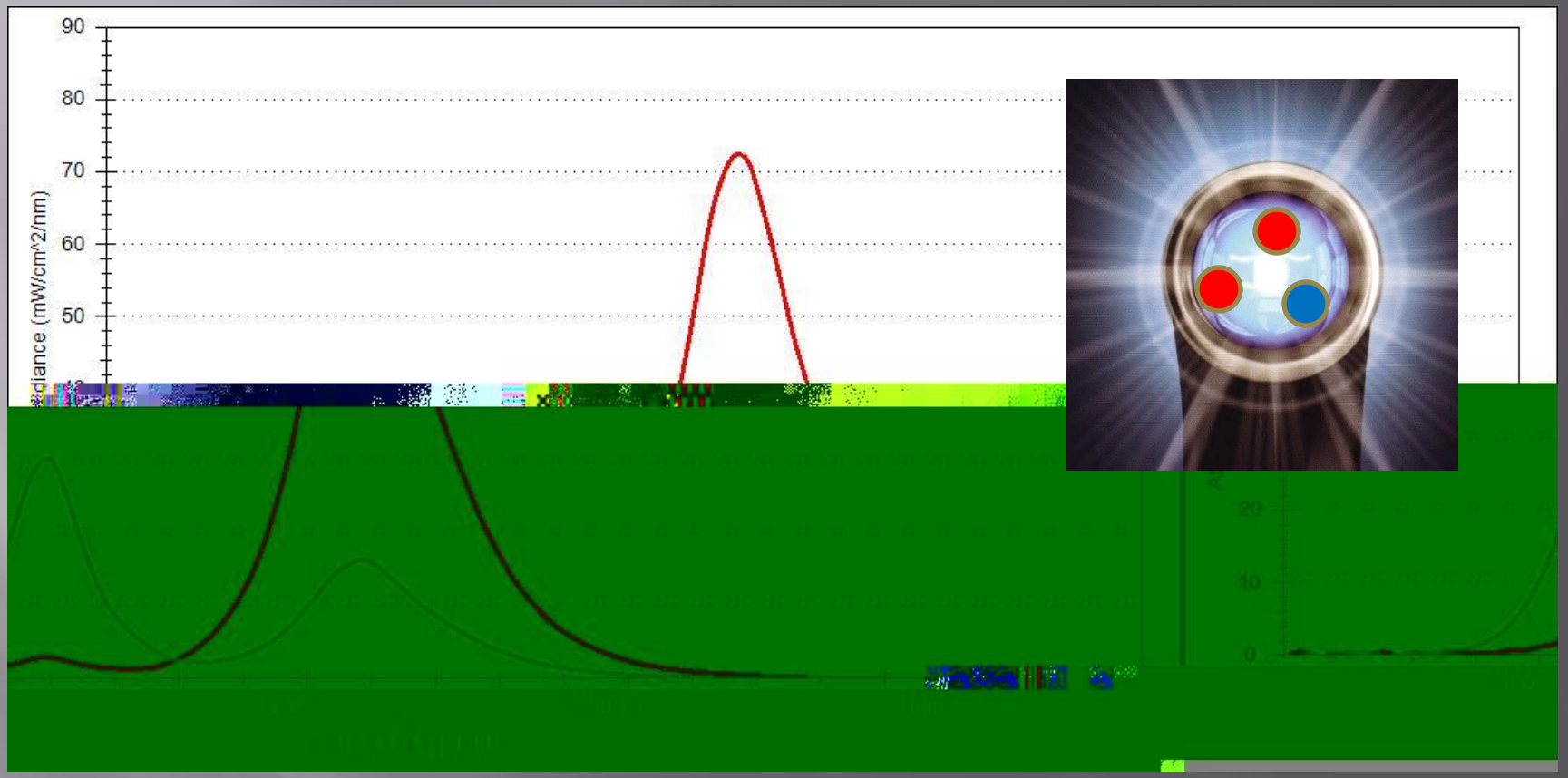
One LCU, held in two different positions for 11 seconds. The light was rotated 90 degrees. Both curves demonstrate good overall intensity.







Factors which could influence photopolymerization



Same light, same overall intensity, but a 90 degree rotation shows that different wavelengths are accentuated just by turning the head of the LED. The placement of the diodes is not evenly distributed in the head of the LCU.

The only way to quantify the energy delivery of curing light operators



MARC®

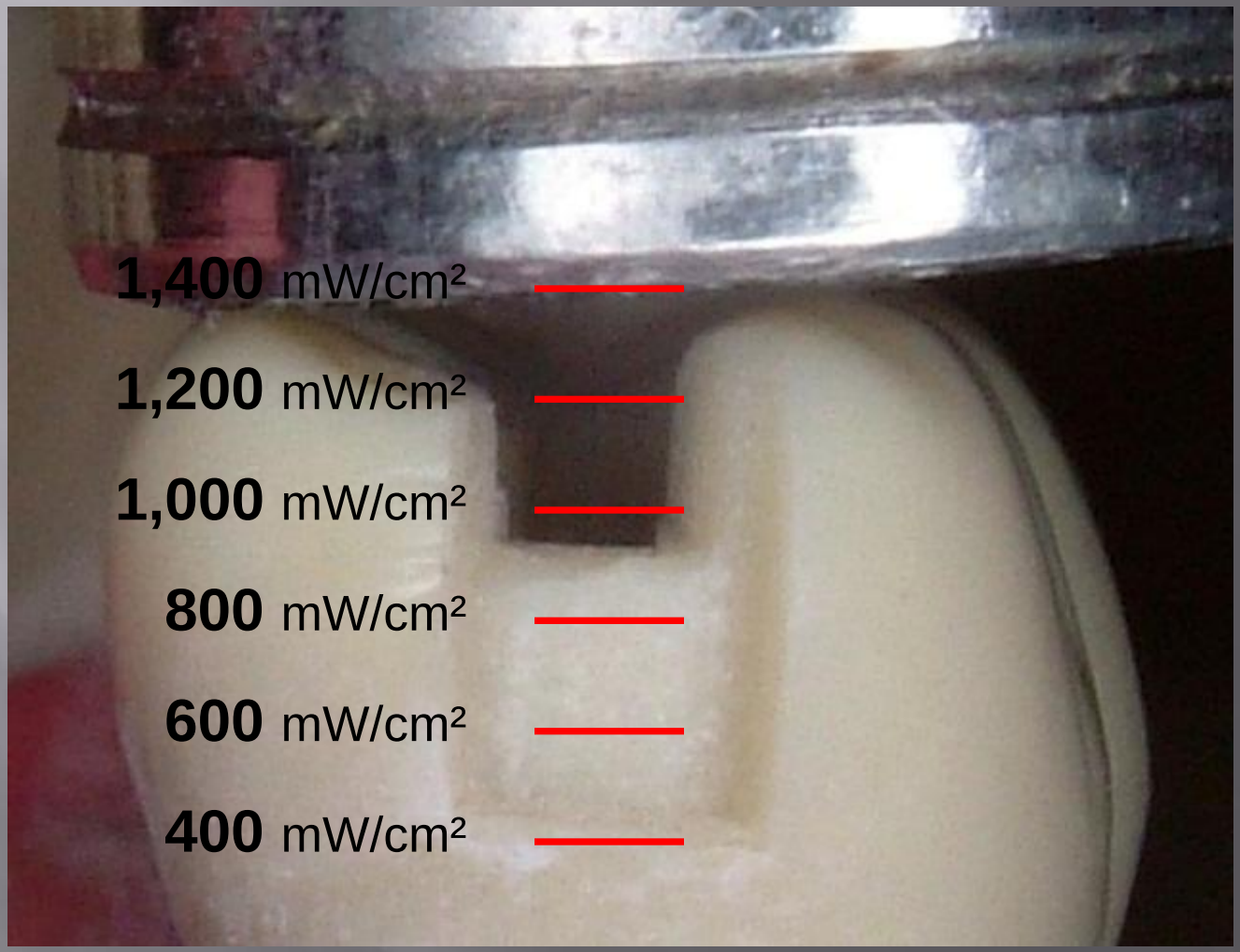
The only way to control energy delivery and monitor transmission



Thanks to Drs. Colin Deacon, Howard Strassler, DC Watts

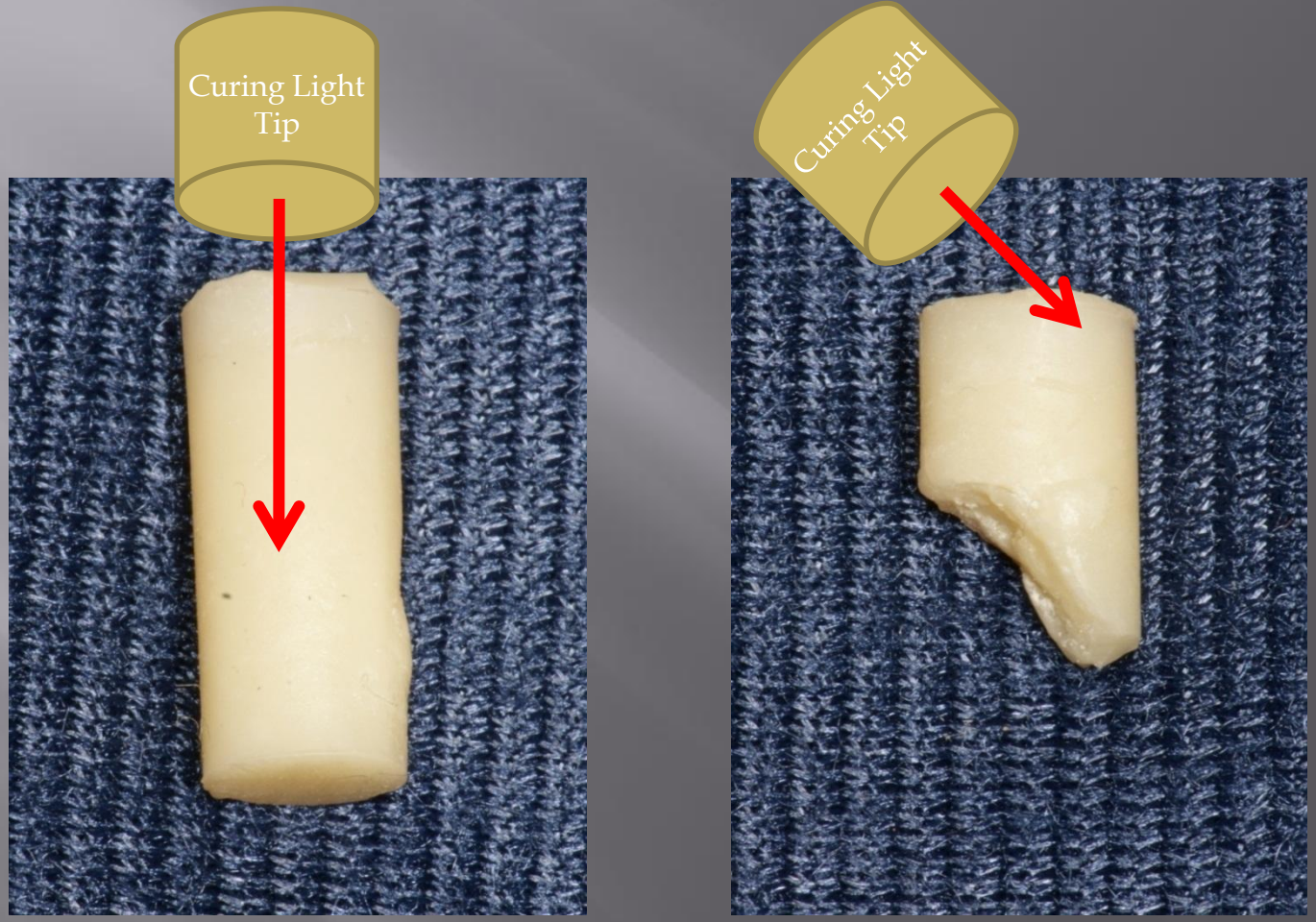
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Effect of Distance



With thanks to Dr. Howard Strassler at the University of Maryland

Effect of Angle



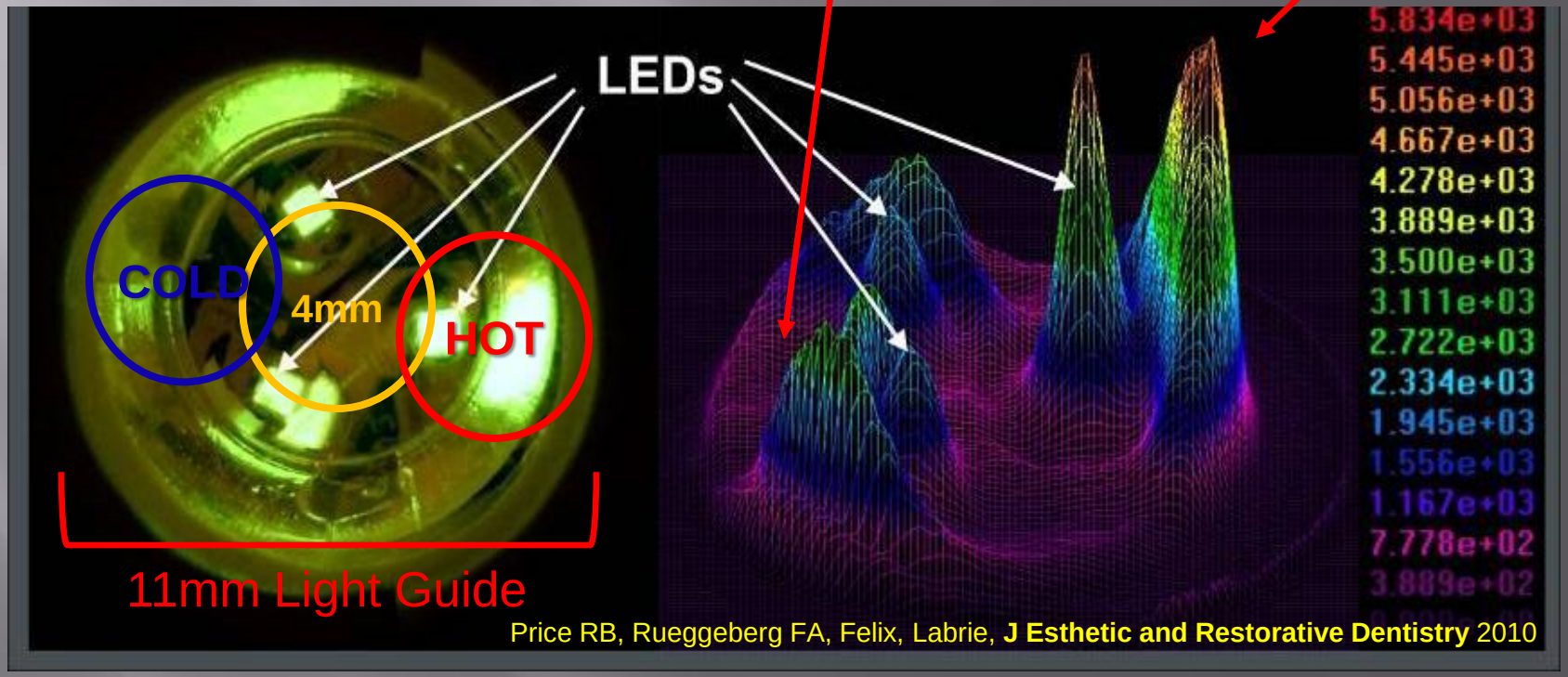
With thanks to Dr. Howard Strassler at the University of Maryland

Irradiance Across the Tip

COLD: 389 mW/cm^2

HOT: 5,834 mW/cm^2

Ave. = 1,300 mW/cm^2



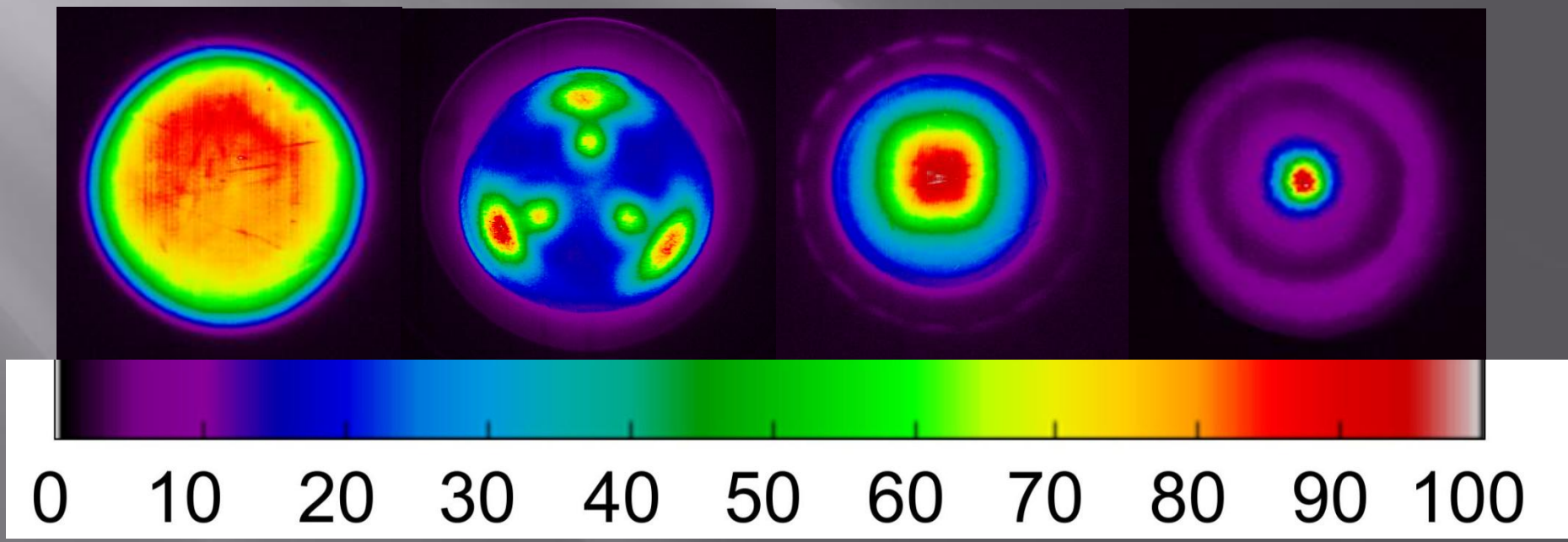
Price RB, Rueggeberg FA, Felix, Labrie, **J Esthetic and Restorative Dentistry** 2010

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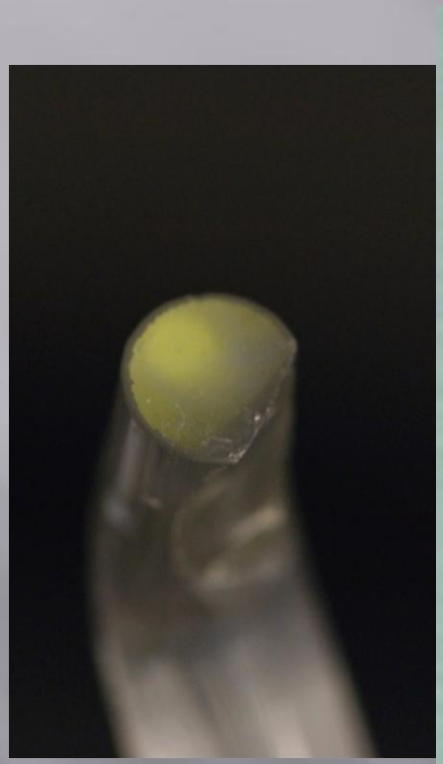
What Actually Reaches the Target?

Four lights that have been recommended by *ADA PPR, Clinicians Report, Reality and/or The Dental Advisor*

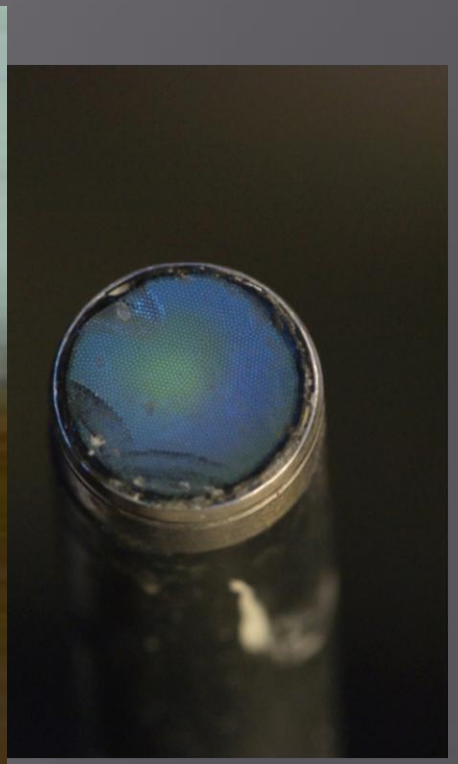
Light A **Light B** **Light C** **Light D**



Damage and Debris!







With thanks to Dr. Howard Strassler at the University of Maryland

Effect of Infection Control



Reduce Irradiance <75%

© BlueLight analytics inc, 2009-2012

There are a lot of different curing lights

…and their clinical performance **is not comparable.**



© BlueLight analytics inc, 2009-2012

Radiometers are Inaccurate

Actual Output = 986mW/cm²



Dentists currently have no reliable measurement tools

© BlueLight analytics inc, 2009-2012

Easy Solutions ?!?!?

Many KOLs say:

1. *"Cure through the buccal or lingual"*
   - <0.6% transmission through
     only 4mm of enamel and dentin

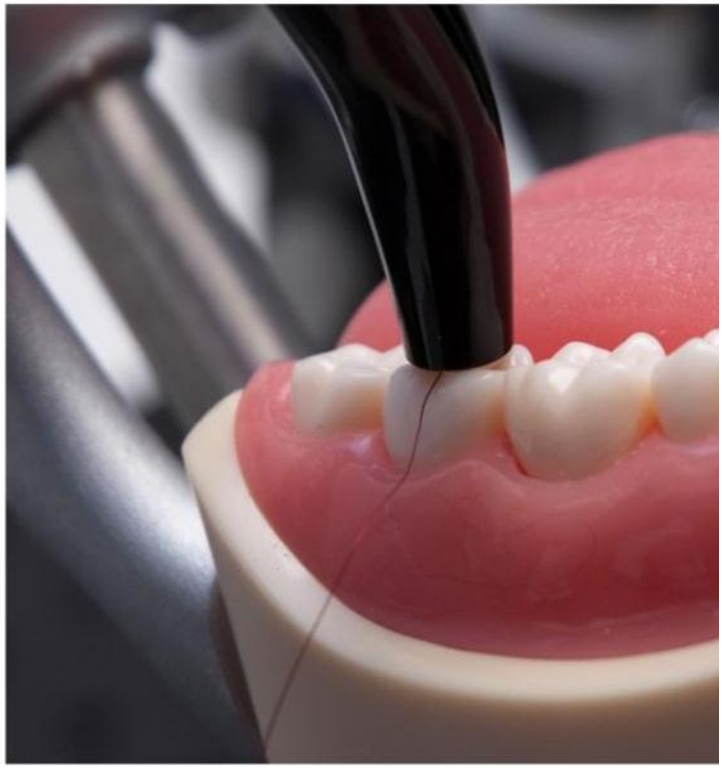
2. *"Just double curing times"*
   - 2x a very small amount of energy
     …is still a small amount of energ
   - Heat can be a concern
   - Spectral mismatching
   - Off-label use has risks

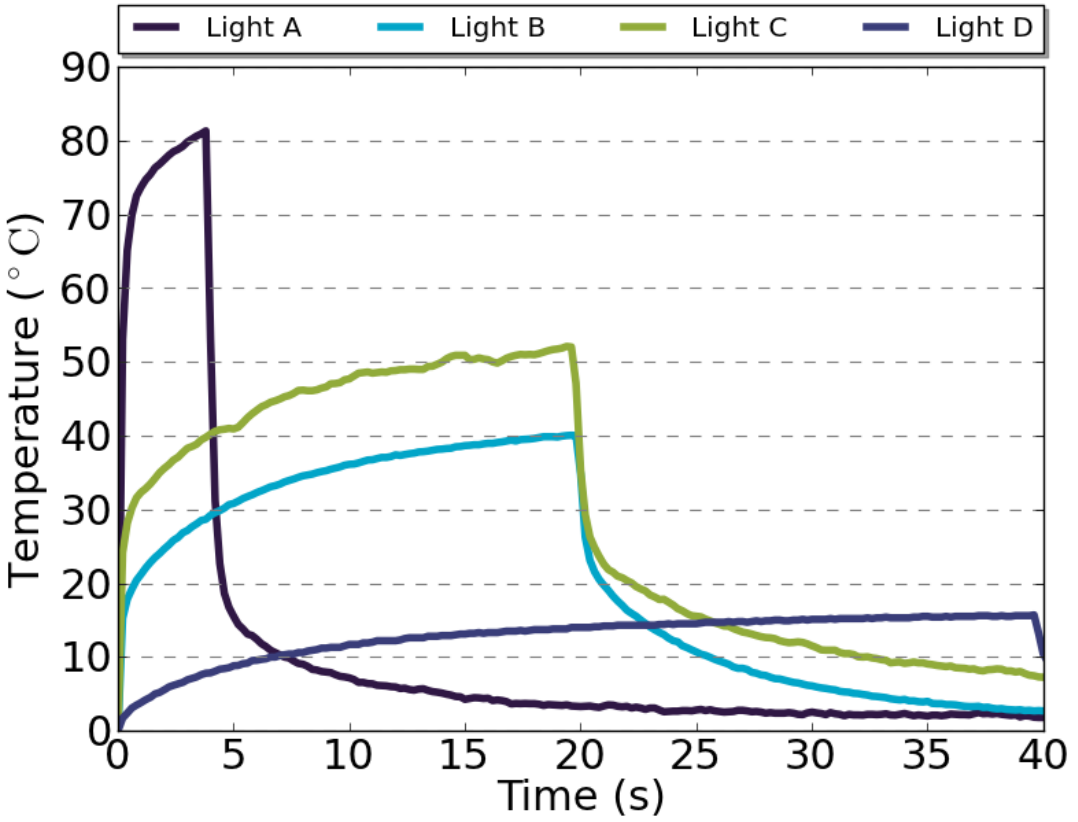


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What About Heat?

Surface temperature change at the curing tip





Pulpal necrosis is associated with a 5.5 °C increase in pulp temp.

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37 Operators
Same Light, Same Tooth, Same Time



© BlueLight analytics inc, 2009-2012

MARC® is an Essential Tool for *Teaching and Evaluating Light Curing*

Common Reality



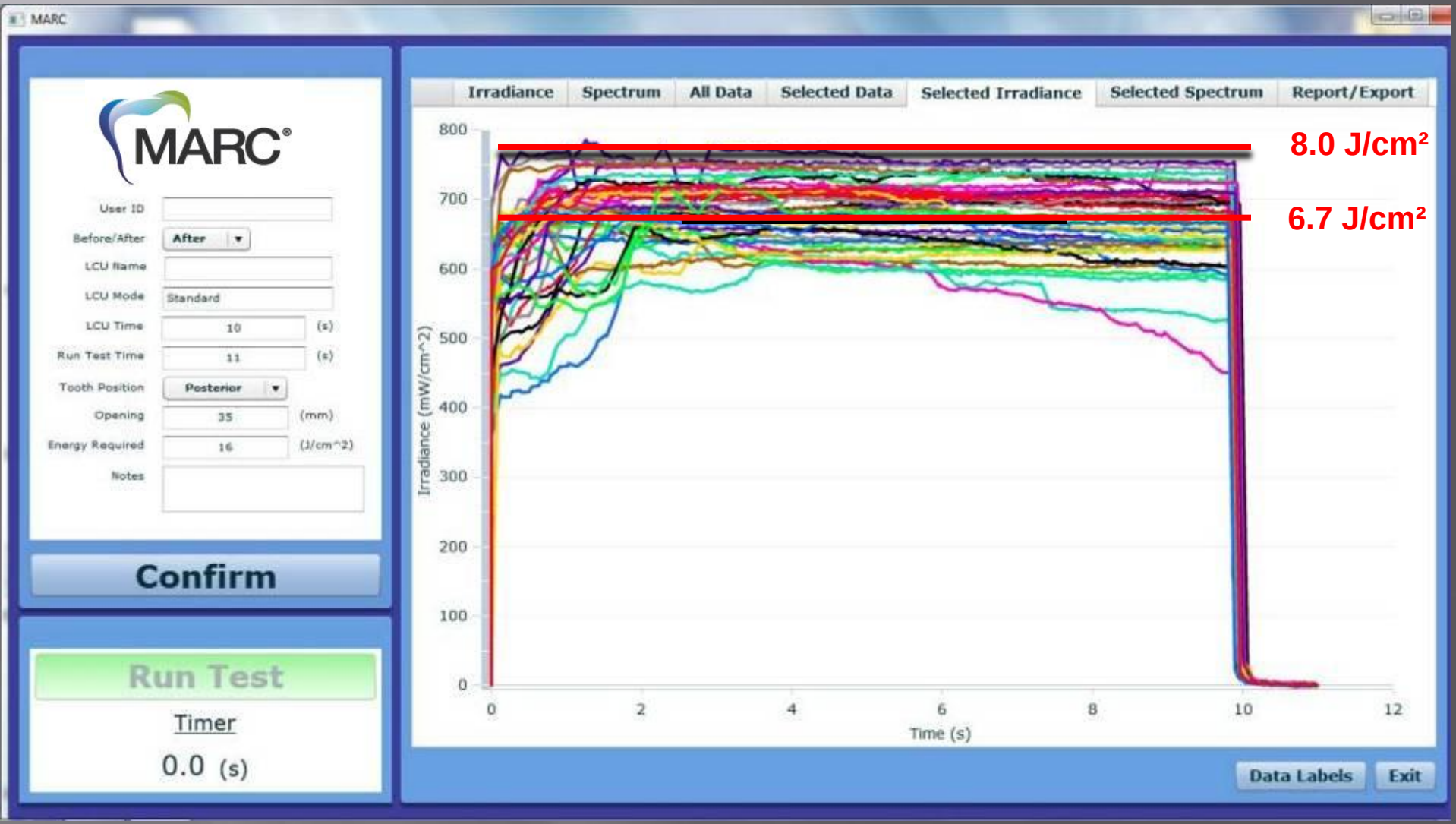
Time to relax after all the hard work

Proper Technique



1. Wear eye protection,
2. Look, 3. Stabilize

Following Group Instruction



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Bottom Line on Lights

- LEDs most popular and durable
- Good as long as output (real) exceeds 500Mw/cm2
- Operator control of light and maintenance/cleanliness of light is more important than the Brand or model

The only way to quantify the energy delivery of curing light operators

MARC®

The only way to control energy delivery and monitor transmission





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Set Your Practice Apart With Laser Caries Detection From KaVo

ACCURATE, RELIABLE, EFFICIENT

DIAGNOdent: The Perfect Adjunct to Your Skills

THE DENTAL ADVISOR — FOUR and ½ PLUS RATING

2001 REALITY — Four Star Award

Leaders in the field of caries research agree: conventional methods of caries diagnosis alone are inadequate and outdated for modern dentistry. Even for an experienced clinician, the accuracy of diagnosing occlusal caries by manual probing with an explorer can be a challenge (Fig. 1).



Proper treatment planning depends upon accurate diagnosis. Since the accuracy of detecting occlusal caries can be difficult, new methods and protocols must be considered. Your visual and radiographic evaluation can be significantly more accurate with the use of KaVo's DIAGNOdent caries detection system (Fig. 2).

DIAGNOdent is the culmination of years of clinical research in which the primary goal was to improve and simplify your assessment of "early" and "hidden" caries within the new decay model (Fig. 3). Now, you can combine your qualitative evaluation with a reliable adjunctive method of quantifying disease progression (Fig. 4). Clearly, improved diagnostic accuracy and early intervention are major benefits.

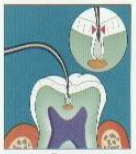

Figure 1


Figure 2

The KaVo DIAGNOdent is a reliable, non-invasive adjunct to the contemporary dentist's arsenal of diagnostic instruments. Highly effective at detecting caries at an early stage, the DIAGNOdent is a Class II laser that safely reflects a light beam off the occlusal surface to record chromopore fluorescence levels within tooth structure (Fig. 5).


Figure 3

The resulting data from this surrogate marker correlates with a specific grade of caries development. As a result, intra-enamel lesions as well as those which have actually cavitated into the dentin are identified and proper treatment can be assessed (Fig 6).


Figure 4

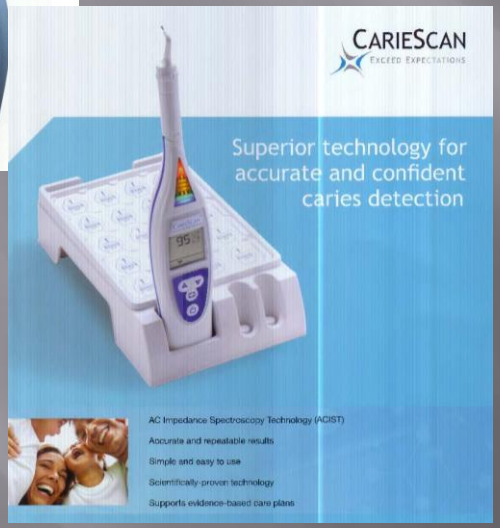
Conventional diagnostic tools, professional judgement, and DIAGNOdent are the new foundation for minimally invasive dentistry in the 21st century.

DIAGNOdent will set your practice apart by generating virtually immediate returns in patient satisfaction and increased caseload.

"I think the DIAGNOdent is a must. It is the best tool in dentistry today. It is used on every patient, and probably used practically as much as we use an explorer... Patient

Laser Fluorescence

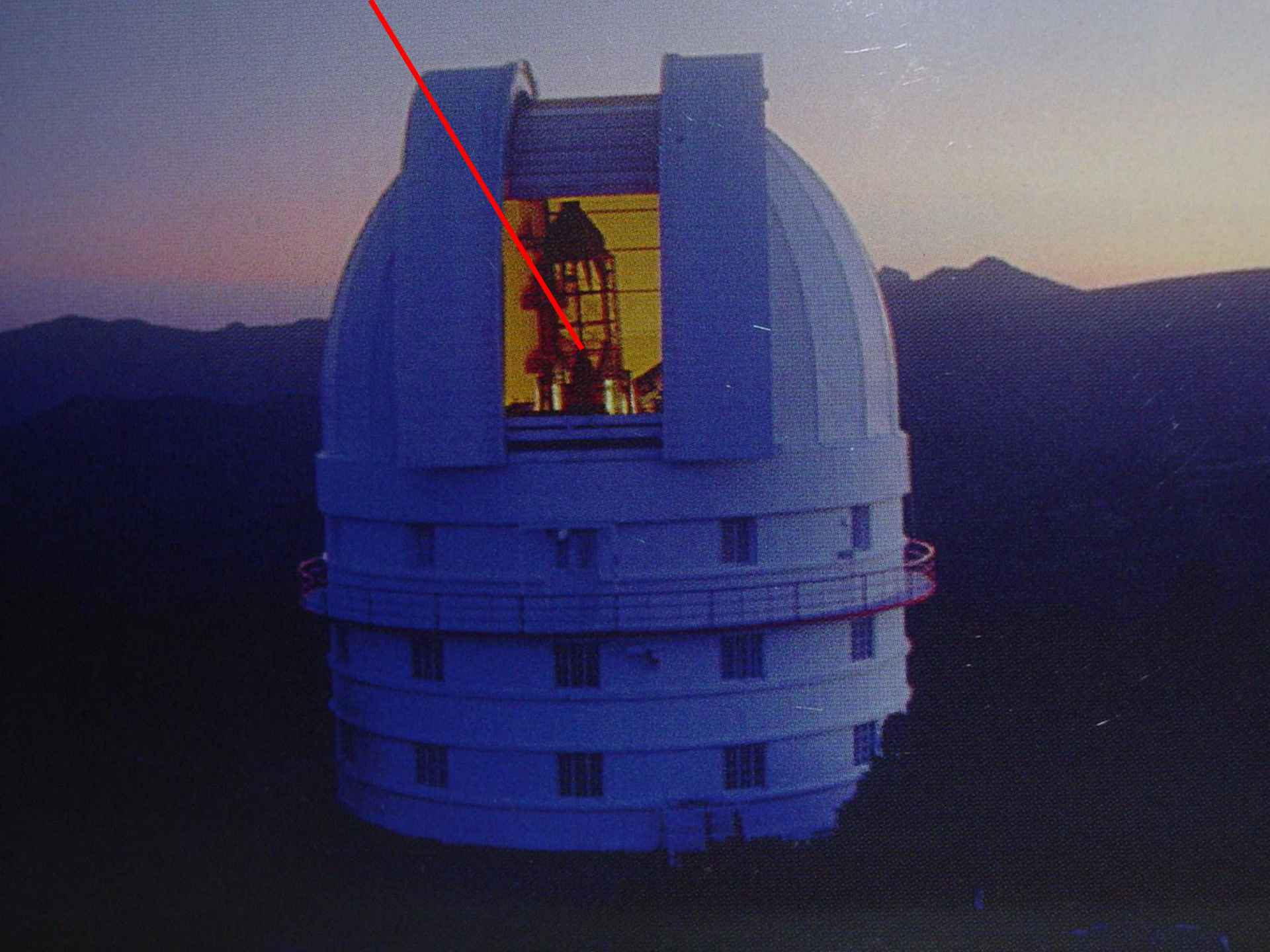




Can't diagnose proximal caries
Can't diagnose caries next to a restoration
Expensive

Laser induced fluorescence measured by Diagnodent is influenced by staining in residual dentin. Therefore, its use to determine **caries endpoint** is doubtful. Neves AA, Coutinho e, De Munck J, Lambrechts P, Van Meerbeek B. J Dent 2011

Identification methods for early occlusal caries are not accurate. The strength of the effectiveness of nonsurgical management strategies for early occlusal caries is weak at best. The evidence suggests that sealing both enamel caries and suspected dentinal caries is the most effective management approach if sealed surfaces can be assured. Bade JD and Shugars DA. *J Evid Base Dent Pract 2006*



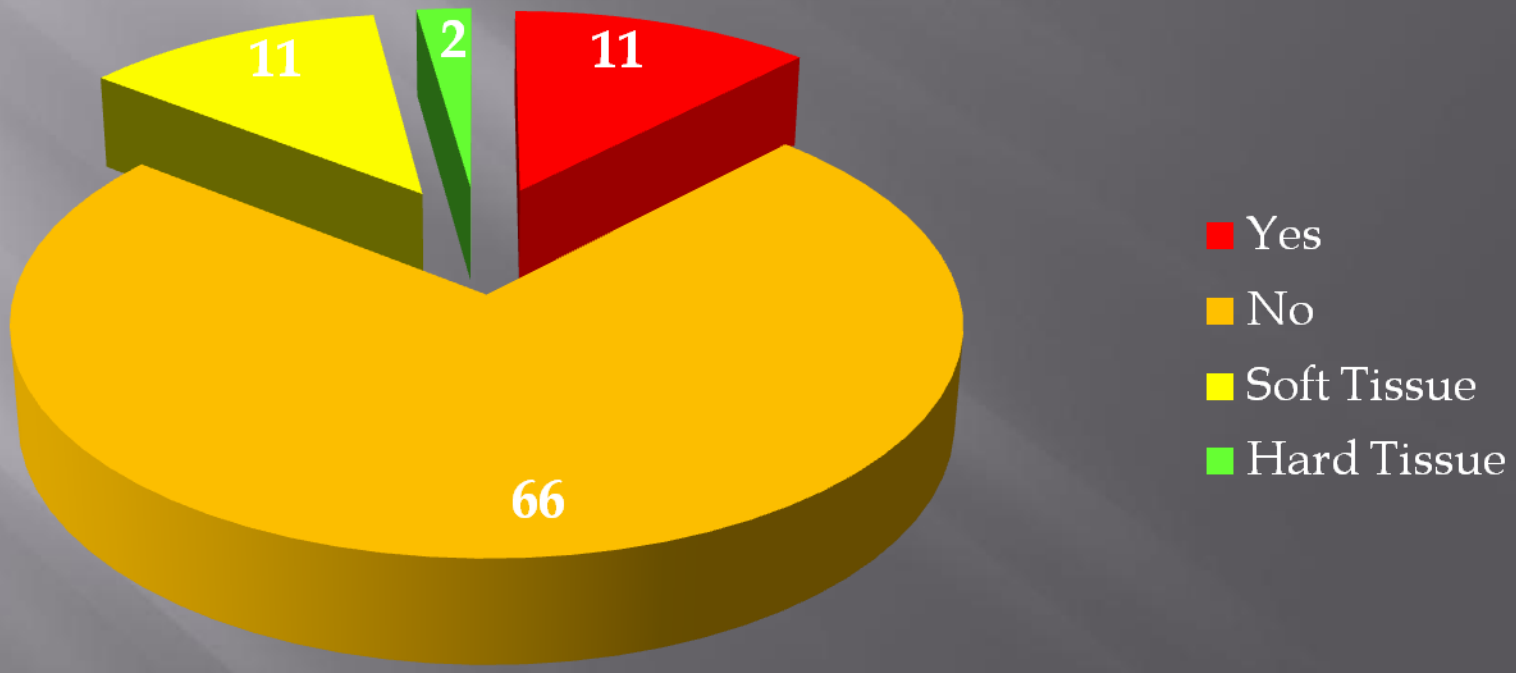








Do you use a dental laser in your clinic? Hard tissue? Soft Tissue?



DECS Materials Survey 2011

Lasers versus Electrosurgery

- Both work well for soft tissue
- LASERS
  - Can also be used for apthous ulcers, periodontal pocket elimination, and uncovering implants
  - **Advantages**
  - use requires minimal or no anesthetic
    do not harm dental hard tissues
    less likely to injure the pulp
    little to no heat production-- can be used around dental implants
    antimicrobial
    remove endotoxins from root surfaces
    increasing popularity in treating periodontal disease
    high-tech
  - **Disadvantages**
    - High cost
    - Slower use
    - Eelectrosurgery can be used in most cases

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HOME » ABOUT ADA » ADA POSITIONS, POLICIES & STATEMENTS » STATEMENT ON LASERS IN DENTISTRY

Statement on Lasers in Dentistry

- **Sulcular Debridement (Curettage)**
- **Laser-Assisted New Attachment Procedure**
- **Reduction of Bacteria Level**
- **Laser Wound Healing**
- **Laser Root Planing**
- **Aid in the Diagnosis of Caries**
- **Hard Tissue Applications**
- **Endodontics**

Business Wire
A Berkshire Hathaway Company

Release Versions
- EON: Enhanced Online News

Company Information Center
Millennium Dental Technologies, Inc.

MDT is in complete agreement with AAP . . .

June 21, 2010 07:00 AM Eastern Daylight Time

American Academy of Periodontology (AAP) Statement Aligns with Millennium Dental Technologies' Treatment Philosophy

Debate over periodontic treatment planning inspires AAP to firmly support protocols that are more beneficial to patients

CERRITOS, Calif.--(BUSINESS WIRE)--Millennium Dental Technologies, Inc. (MDT), pioneers of the patented LANAP™ protocol for the treatment of gum disease and the manufacturer of the PerioLase® MVP-7™ digital dental laser, are aligned with the American Academy of Periodontology (AAP) position statement that "efforts should be made to save a patient's natural dentition."

MDT is in complete agreement with AAP that classifies [illegible] dures such as tooth extraction and dental i[illegible]ent as last-resort techniques. The ideal is to provide [illegible] inically proven regenerative outcome" as [illegible] clinicians to save previously "unsa[illegible] DT's own LANAP™ protocol. While sor[illegible] are dictating suboptimal treatment [illegible] venience, LANAP™ treatment stand[illegible] preferred health benefits in addition [illegible] oost patient compliance. It's all a[illegible]

"At the heart of the matter, the LANAP™ treatment's ability to build [illegible]althy bone and tissue lies at the [illegible] its success"





WHAT DID THE AAP REALLY SAY?

J Periodontol • April 2011

American Academy of Periodontology Statement on the Efficacy of Lasers in the Non-Surgical Treatment of Inflammatory Periodontal Disease*

Remains controversial…

Laser-mediated sulcular and/or pocket debridement: **Little to no benefit** beyond SPR alone. Currently, there is **minimal evidence to support use** of a laser for the purpose of subgingival debridement, either as monotherapy or adjunctive to SPR.

Reduction of subgingival bacterial levels: lasers are **unpredictable and inconsistent** in their ability to reduce subgingival microbial loads beyond that of SRP alone.

Scaling and Root Planing: Er:YAG laser has the greatest potential for effective SRP, however, there is **potential for root surface damage** because the Er:YAG laser is a hard tissue laser. Clinical data are conflicting. Further study is needed.

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America's leading advocate for oral health

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HOME » ABOUT ADA » ADA POSITIONS, POLICIES & STATEMENTS » STATEMENT ON LASERS IN DENTISTRY

Statement on Lasers in Dentistry



Sulcular Debridement (Curettage)

The dental literature indicates that when used as an adjunct to meticulous root planing, mechanical or chemical curettage (i.e., the intentional removal of the epithelial lining of the sulcus) offers no consistent benefit beyond scaling and root planing alone with respect to gain of the periodontal attachment. As such, curettage was deemed several years ago to be of no known clinical value. Accordingly, the ADA code for curettage was omitted from the CDT-4 code listing. There is little convincing clinical evidence that adjunctive laser curettage produces a result superior to adjunctive mechanical or chemical curettage, or even scaling and root planing alone. Current evidence suggests that therapies intended to arrest and control periodontitis depend primarily on effective root debridement.

Laser-Assisted New Attachment Procedure LANAP

A 2007 publication compared the probing depth, attachment gain, and type of attachment from traditional mechanical therapy of advanced chronic periodontitis vs. traditional mechanical therapy that included two intrasulcular applications of Nd: YAG; one aimed at removing the sulcular epithelium and another said to "seal" the pocket.[2] In this study, histology was performed on 6 pairs of single-rooted teeth at 3 months. Laser-treated pockets tended to show greater probing depth reductions and clinical attachment gains than non-lased pockets. Based on measurements from notches placed in periodontally involved root surfaces before treatment, lased teeth showed evidence of new cementum while 5 of the 6 control teeth showed a long junctional epithelial attachment. This study concluded that the Laser Assisted New Attachment ProcedureTM (LANAP) can be associated with cementum-mediated new connective-tissue attachment and apparent periodontal regeneration of diseased root surfaces in humans.

Although the Council is optimistic regarding the potential for lasers to enhance effectiveness in treating periodontitis, dentists should note that **this study provides no more than pilot validation** for this treatment concept. **The study was not blinded, and the sample size was small** thereby limiting extrapolation of the results to the general population. Further, pre-treatment notches in the teeth were difficult to place, hard to know exactly where they were placed and are difficult to clearly detect on histological specimens. Moreover, the advanced periodontal destruction initially present in these 6 test teeth make it difficult to extrapolate these results to cases of early and moderate chronic periodontitis, where the anatomic environment, laser energy distribution and clinical outcome may differ substantially. It is also unclear what laser-based "sealing" of a treated periodontal sulcus is and, if real, what benefits it might provide. **Additional clinical data from properly designed clinical trials with adequate sample sizes are still required before it can be known to what extent LANAP is safe and effective across the spectrum of patients with chronic periodontitis.** The Council therefore cautions clinicians to weigh the available evidence for LANAP when considering the options available for treatment of the periodontal diseases.

2. Yukna, RA; Carr RL; Evans, GH: Histologic Evaluation of an Nd: YAG Laser-Assisted New Attachment Procedure in Humans. Int J Perio Rest Dent 27(6):577–587, 2007.

Reduction of Bacteria Level

Lasers, as a group, have **inconsistently demonstrated the ability to reduce microorganisms** within a periodontal pocket. It appears from the literature that mechanical root debridement remains a priority to attain improvements in clinical attachment levels. However, limited new data suggest that clinical outcomes may be enhanced by the adjunctive use (following root debridement) of a bactericidal irrigant activated by a cold laser.[3]

Laser Wound Healing

Methods using low-powered lasers to improve wound healing have been noted for many years but the reported **results have been mixed**. While the risk of thermal damage from low-powered lasers appears minimal, the Council considers **the application of laser energy purely for the purpose of improved wound healing to be controversial and not well supported by clinical studies.**

Laser Root Planing

Erbium lasers show potential for effective root debridement. The Er:YAG laser has been shown, in vitro, to remove calculus[4] and to negate endotoxin.[5] Clinical data also exist that suggest the **Er:YAG laser can result in a superior calculated clinical attachment gain compared with mechanical scaling and root planing alone.**[6] The Council views such developments as encouraging. Additional well-designed comparative studies would be helpful to clinicians in confirming these results. However, hard tissue Erbium lasers and can damage root surfaces.

3. Anderson, R; Loebel, N; Hammond, D; Wilson, M: Treatment of periodontal disease by photodisinfection compared to scaling and root planning. J Clin Dent 18(2):34–38, 2007.
4. Ting, CC; Fukuda, M; Watanabe, T; Aoki, T; Sanaoka, A; Noguchi, T: Effects of Er, Cr:YSGG laser irradiation on the root surface: morphologic analysis and efficiency of calculus removal. J Periodontol 78(11):2156–2164, 2007.
5. Folwaczny, M; Aggstaller, H; Mehl, A; Hickel, R: Removal of bacterial endotoxin from root surface with Er: YAG laser. Am J Dent 16(1):3–5, 2003.
6. Crespi, R; Cappare, P; Toscanelli, I; Gherlone, E; Romanos, GE. Effects of Er: YAG laser compared to ultrasonic scaler in periodontal treatment: a 2-year follow-up split-mouth clinical study. J Periodontol. 78(7): 1195–2000, 2007.

Aid in the Diagnosis of Caries

Laser fluorescence may be a useful adjunct in the detection of early enamel caries.[7] The level of energy used in this application poses little risk to the patient and offers potential benefits. Presently, one product available commercially in the United States is based on this laser technology, using a diode laser at 655-nm wavelength. Other adjunctive caries detection products available in the United States do not use laser technology.





"**Identification methods for early occlusal caries are not accurate**. The strength of the effectiveness of nonsurgical management strategies for early occlusal caries is weak at best. The evidence suggests that sealing both enamel caries and suspected dentinal caries is the most effective management approach if sealed surfaces can be assured." Bader JD and Shugars DA. *J Evid Base Dent Pract 2006*

Endodontics

The primary goal for endodontic therapy is cleansing, shaping and sealing the root canal system. Lasers are cleared for pulpotomy, blood flow measurements, apicoectomy, and illumination of the endodontic orifice and for softening gutta percha. Currently, there are no devices that can accurately measure the pulpal blood flow. Lasers used as an adjunct have been shown to aid in the cleansing of the root canal space. *In vitro* evidence indicates that **lasers are equivalent to conventional rotary instrumentation for shaping the coronal and middle thirds, but inferior for shaping the apical 1/3 of the root canal system.**

There is no evidence that lasers provide a superior seal or higher clinical success rate than conventional instrumentation.



Hard Tissue Applications

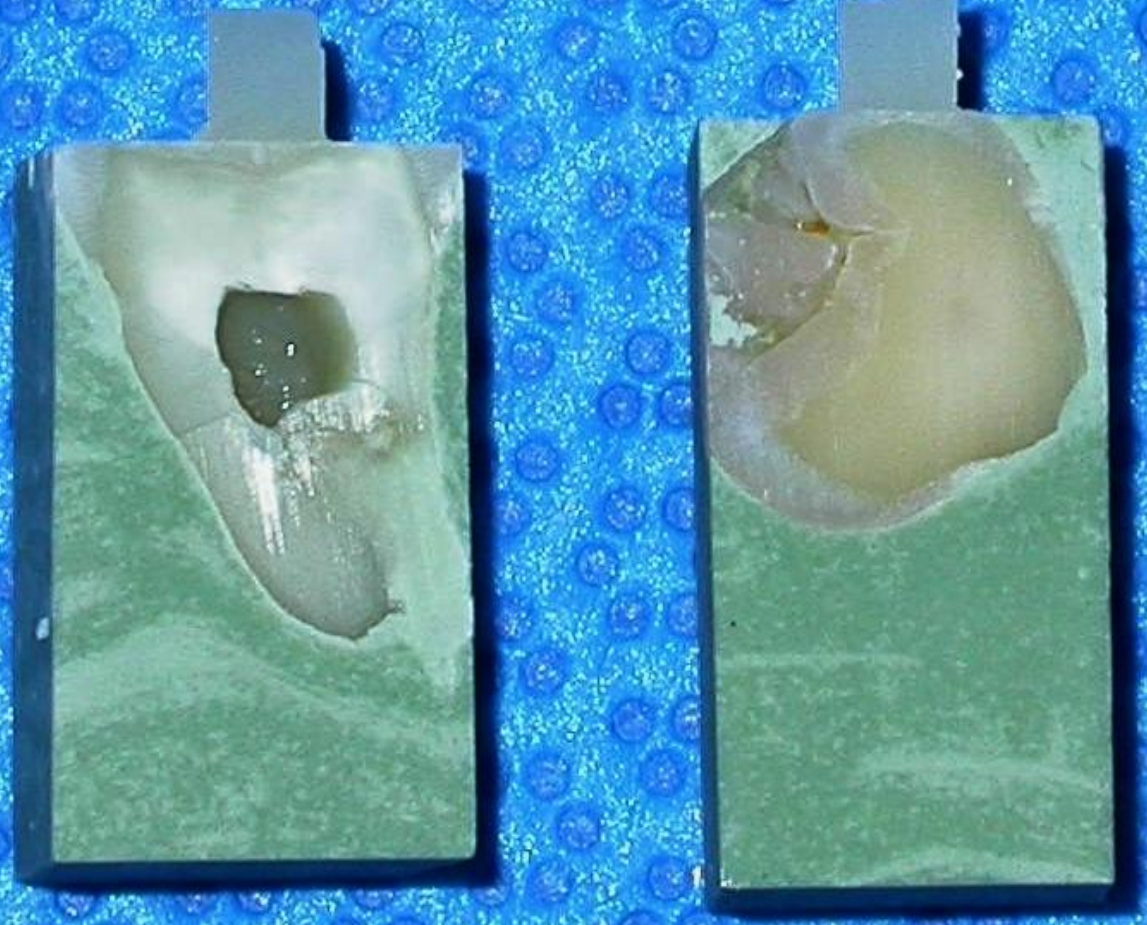
In general, the Council believes these applications to be reasonable based upon supporting in vitro and in vivo studies. Some clinical studies exist that report equivalency to traditional hard tissue removal methods.[8] However other studies **question the reliability of bonding to dentin surfaces prepared with an Er,Cr:YSGG laser** [7,9] or suggest that Er:YAG laser-cut preparations in enamel and dentin are equivalent to air-abrasion preparations with respect to resin bond strengths.[10] The ability to perform cavity preparations with the Er:YAG and Er,Cr:YSGG lasers **without local anesthetic**, where possible and where appropriate, is viewed positively by the Council. The shallow penetration of the Er: YAG and Er, Cr: YSGG lasers reduce the thermal risk to the pulp in comparison to other more penetrating laser wavelengths. While the Council acknowledges that the Er:YAG and Er, Cr:YSGG lasers represent an alternative method of removing enamel, dentin and caries, **clinicians are encouraged to be cautious** and to be aware of the benefits and risks involved in the removal of hard tissue and caries using lasers and traditional cavity preparation methods.

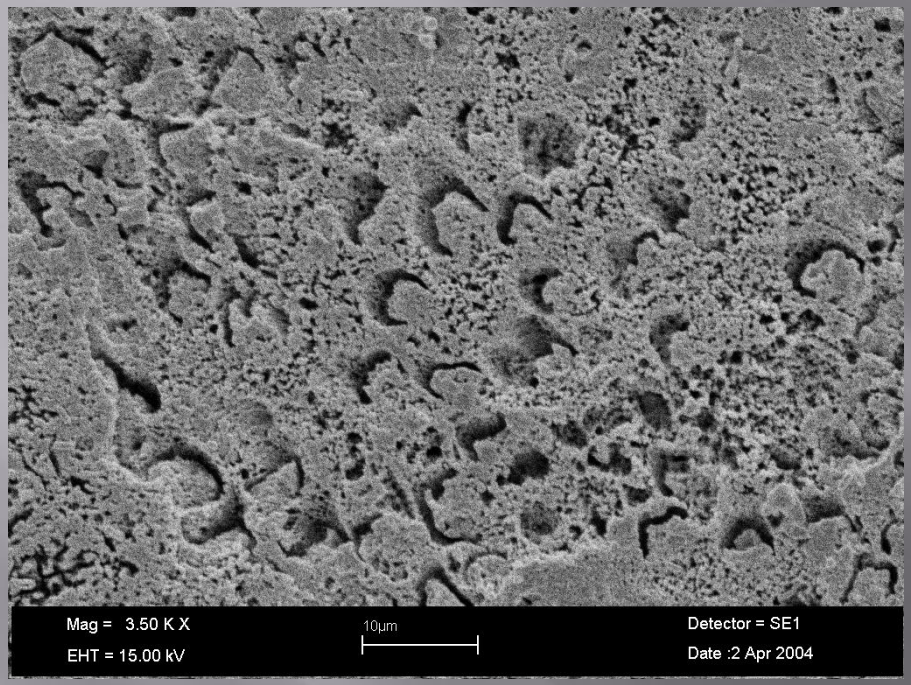
7. Adhesion to laser-ablated or laser-etched dentin and enamel was inferior to that of conventional rotary preparation and acid etching. Dunn WJ, Davis JT, Bush AC, *Dent Mater 2004*

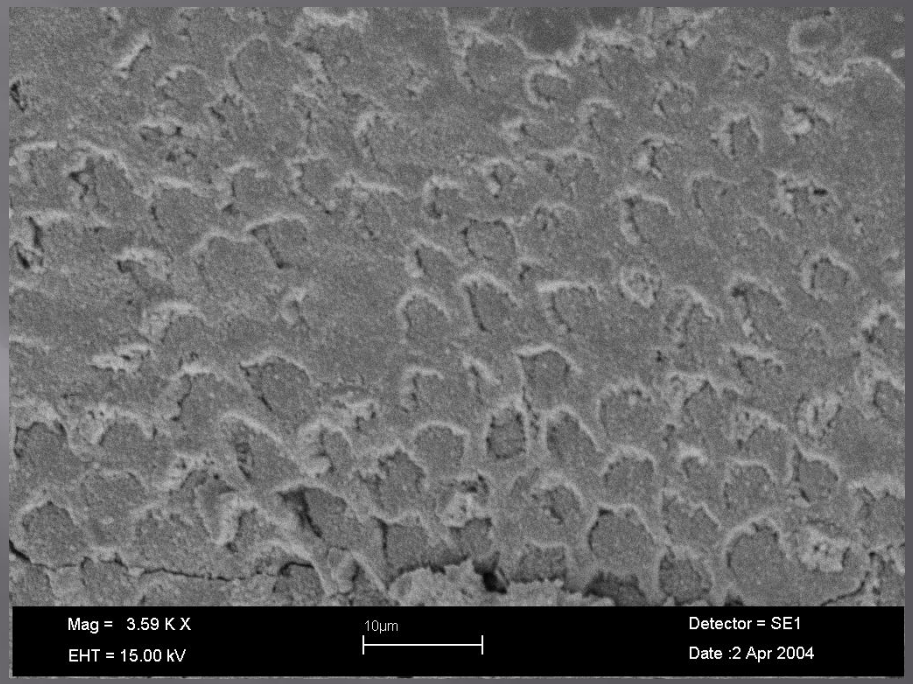
8. Dommisch, H; Peus, K; Kneist, S; Krause, F; Braun, A; Hedderich, J; Jepsen, S; Eberhard, J: Fluorescence-controlled Er: YAG laser for caries removal in permanent teeth: a randomized clinical trial. Eur J Oral Sci 116(2):170–176, 2008.

9. Tachibana, A; Marques, MM; Soler, JM; Matos, AM: Erbium, chromium: yttrium scandium gallium laser for caries removal: influence on bonding of a self-etching adhesive system. Lasers Med Sci 23(4): 435–441, 2008.

10. Souza-Zaroni, WC; Chinelatti, MA; Delfino, CS; Pecora, JD; Palma-Dibb,RG; Corona, SA: Adhesion of a self-etching system to dental substrate prepared by Er:YAG laser or air abrasion. J Biomed Mater Res B Appl Biomater 86B (2): 321–329, 2008.

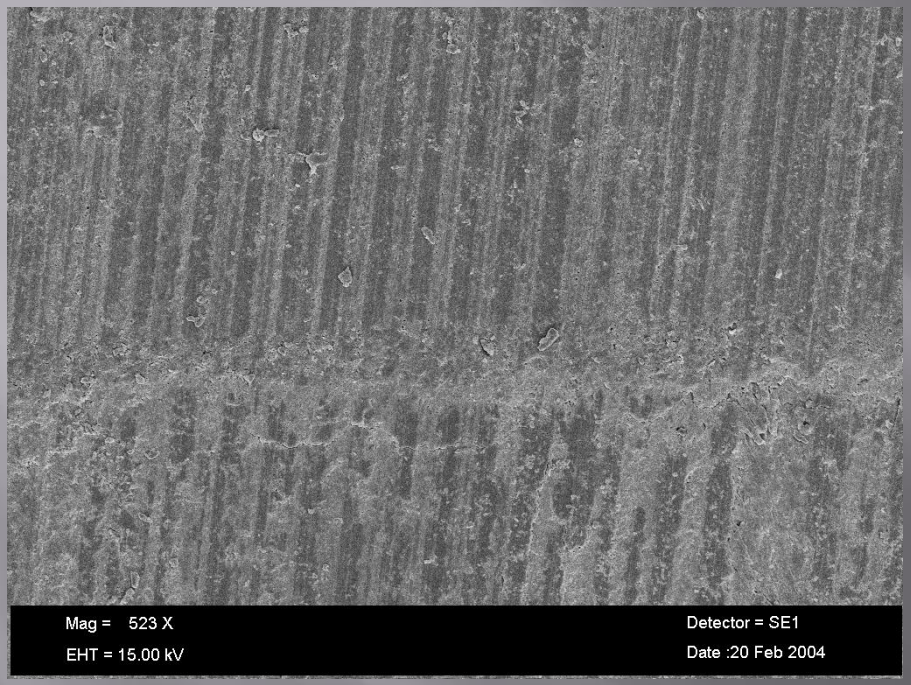




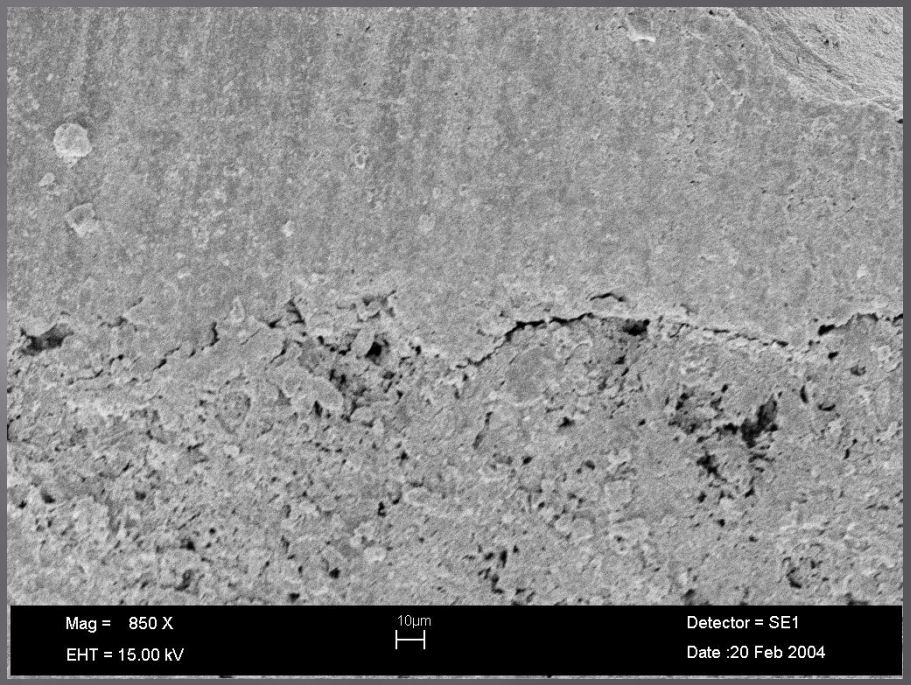


Enamel acid etched 37% H3PO4

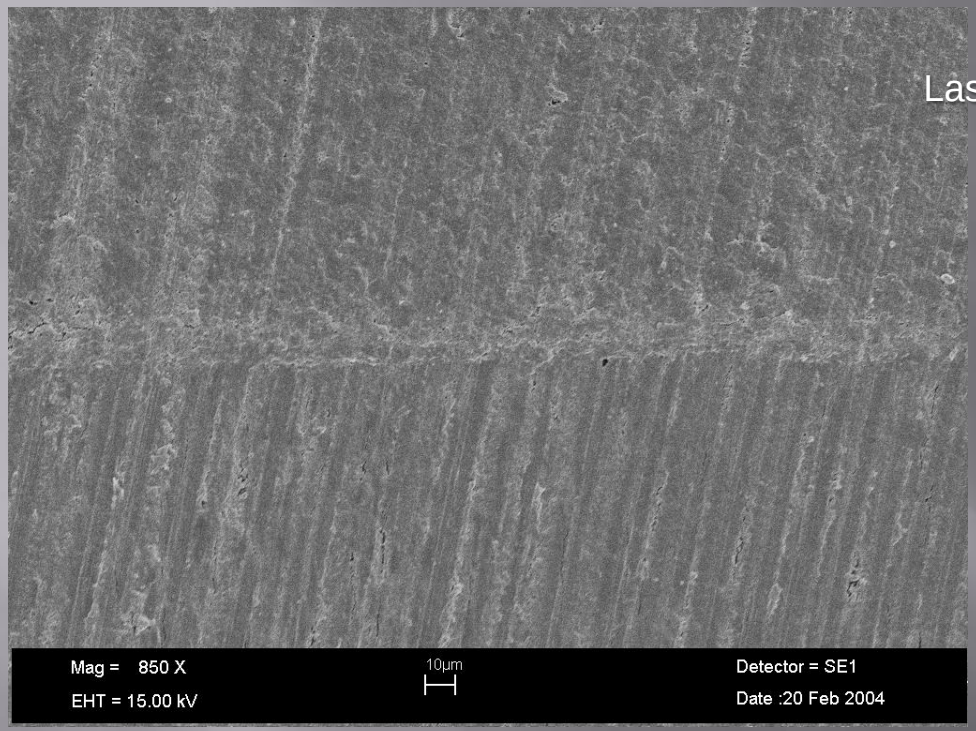
Enamel laser ablated



Acid etched enamel bonded to composite



Laser ablated enamel bonded to composite



Acid etched dentin bonded to composite

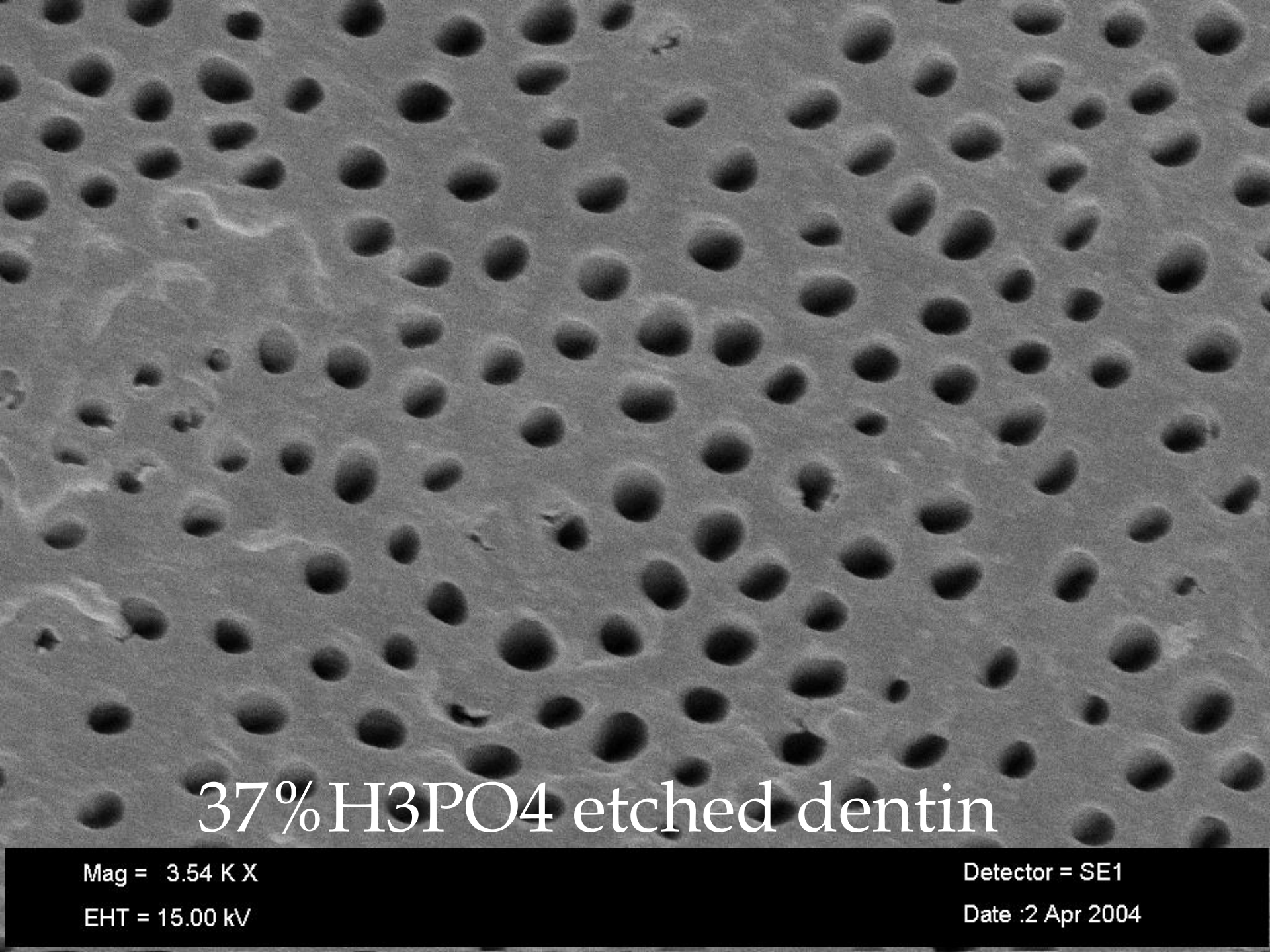


Laser ablated & acid etched dentin bonded to composite

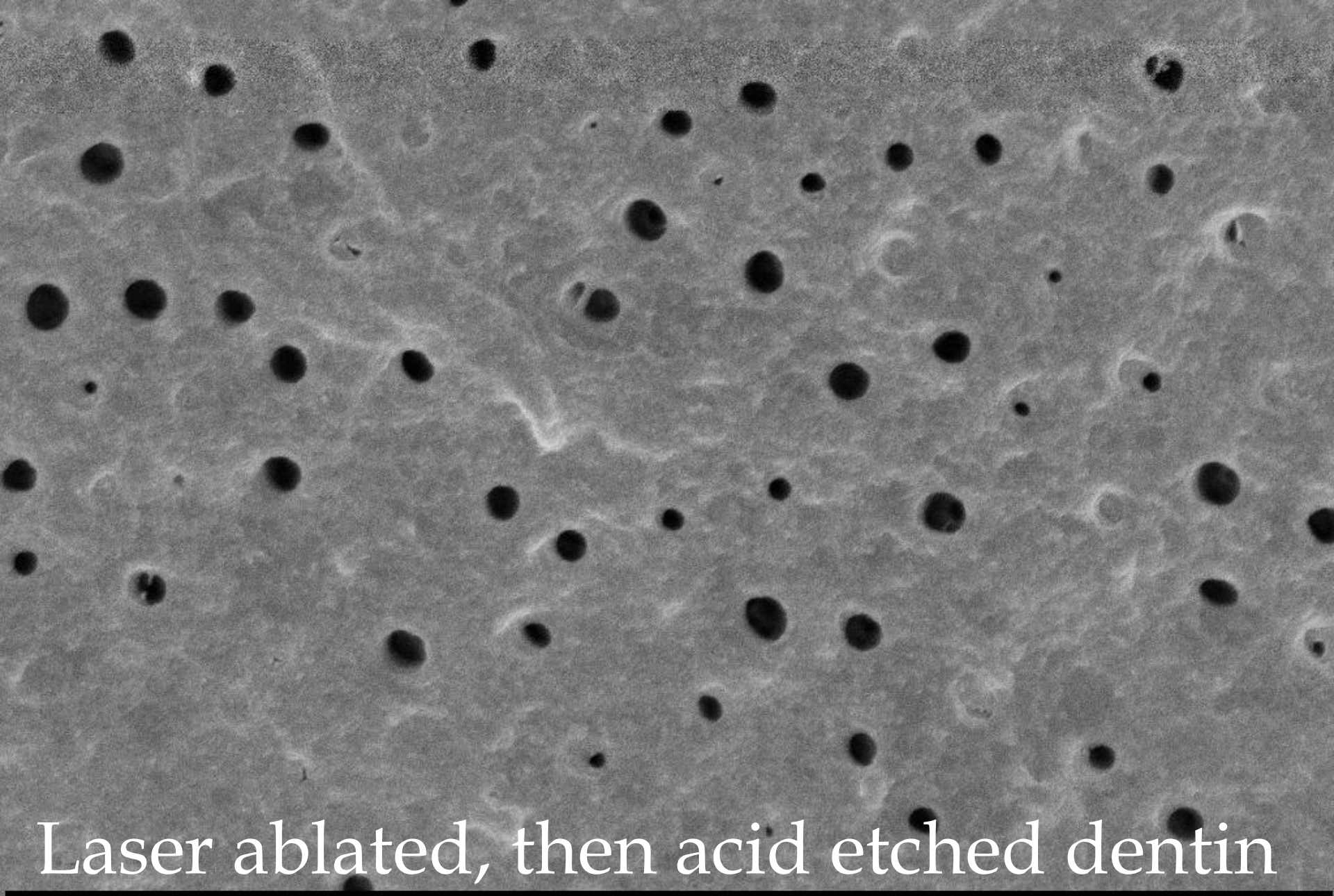


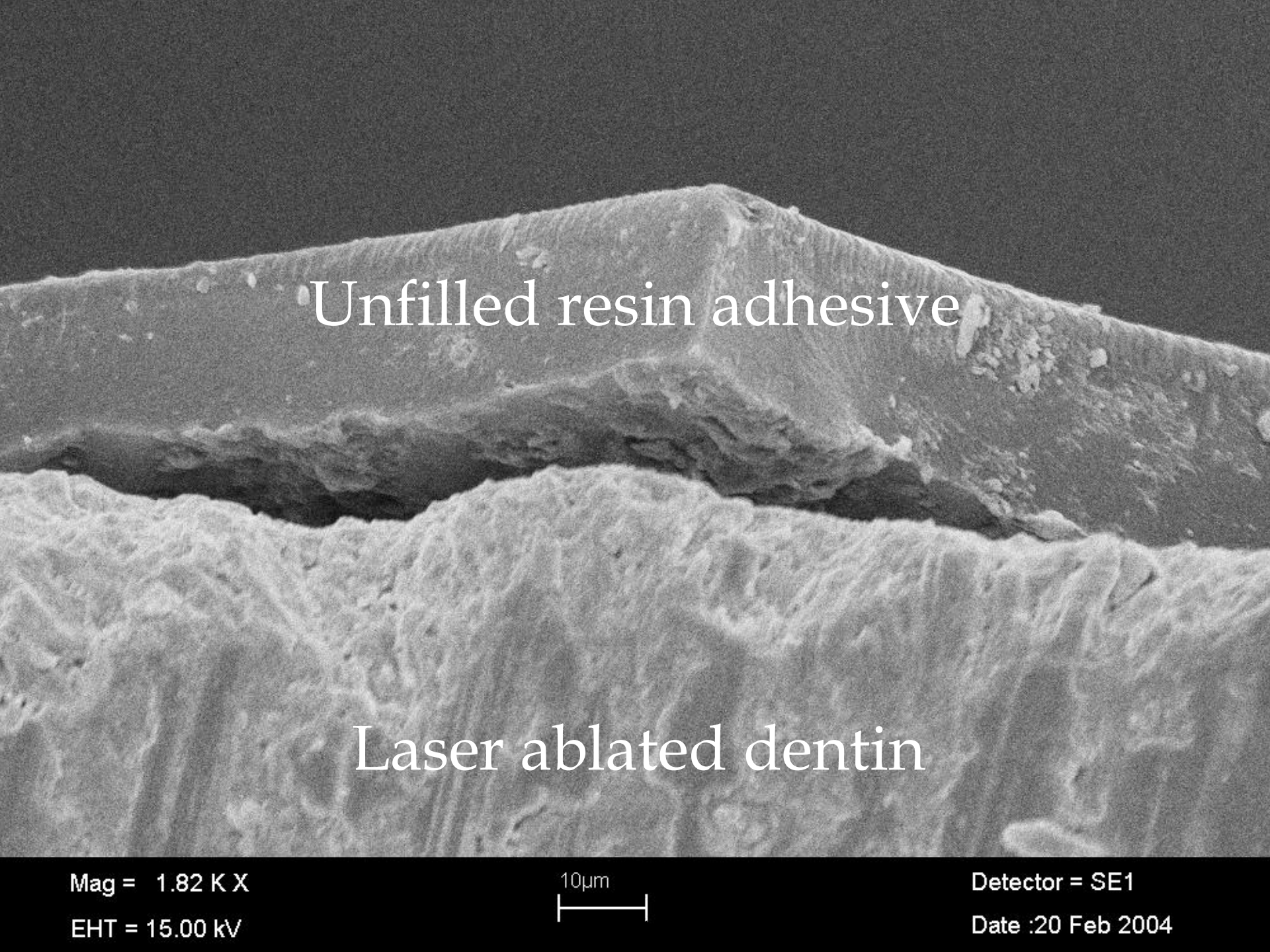
Laser ablated dentin bonded to composite

Adhesion to laser-ablated or laser-etched dentin and enamel was inferior to that of conventional rotary preparation and acid etching. Dunn WJ, Davis JT, Bush AC, *Dent Mater 2004*


37%H3PO4 etched dentin
Mag = 3.54 K X
EHT = 15.00 kV
Detector = SE1
Date :2 Apr 2004


Laser ablated dentin
Mag = 9.17 K X
EHT = 15.00 kV
Detector = SE1
Date :2 Apr 2004


Laser ablated, then acid etched dentin
Mag = 3.50 K X
EHT = 15.00 kV
Detector = SE1
Date :2 Apr 2004


Unfilled resin adhesive
Laser ablated dentin
Mag = 1.82 K X
EHT = 15.00 kV
10µm
Detector = SE1
Date :20 Feb 2004

And now for something completely different…





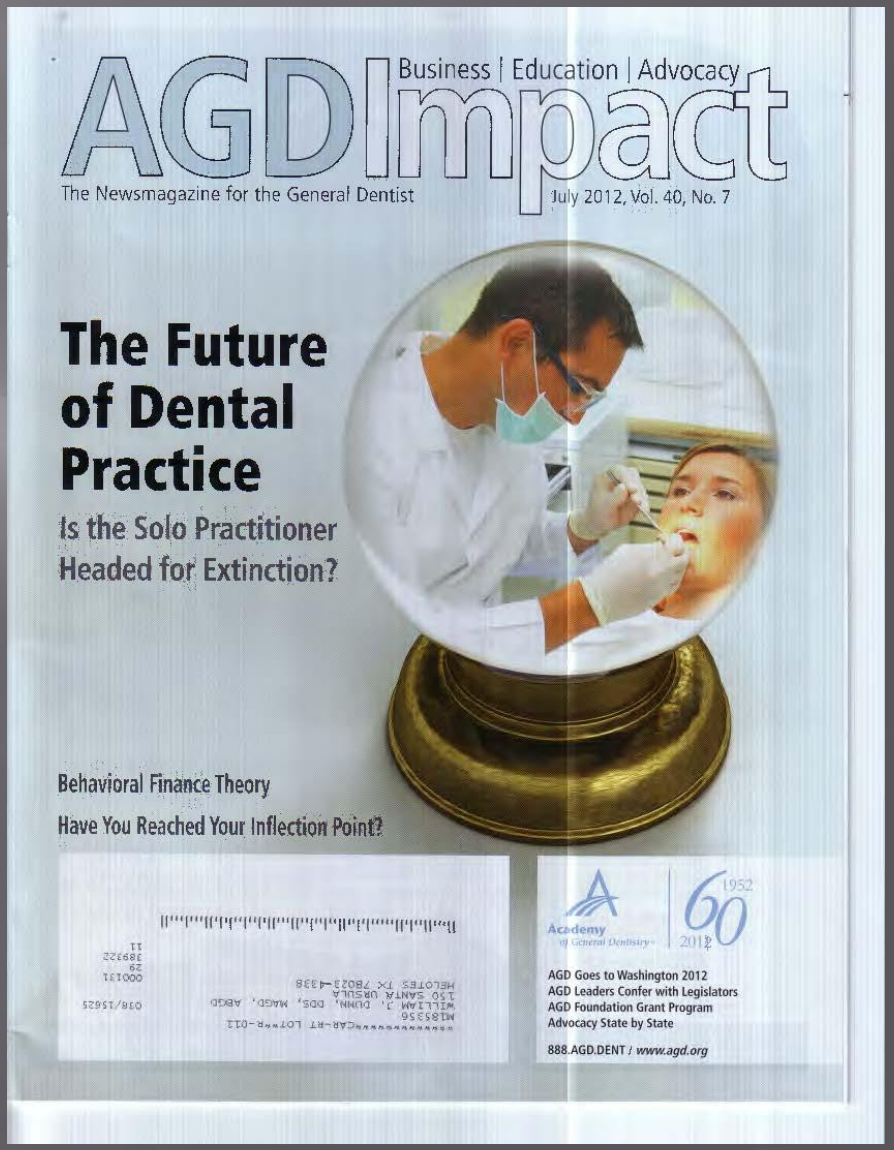

Onpharma
Onpharma
Sodium Bicarbonate Inj., 8.4%, USP
Neutralizing Additive Solution
4 CARTRIDGES
Onset

Some Final Thoughts

Consumers drive the market, not the research.
Sometimes we learn a lesson (Galloy, Solitaire, Sculpture Fibrekor).
Don't be the first to get a product,
but also don't be the last.
New products are sometimes just old products in disguise, with a newer advertising pitch.
Go with a tested product that has some clinical data
Go with a company whose service record is impressive.

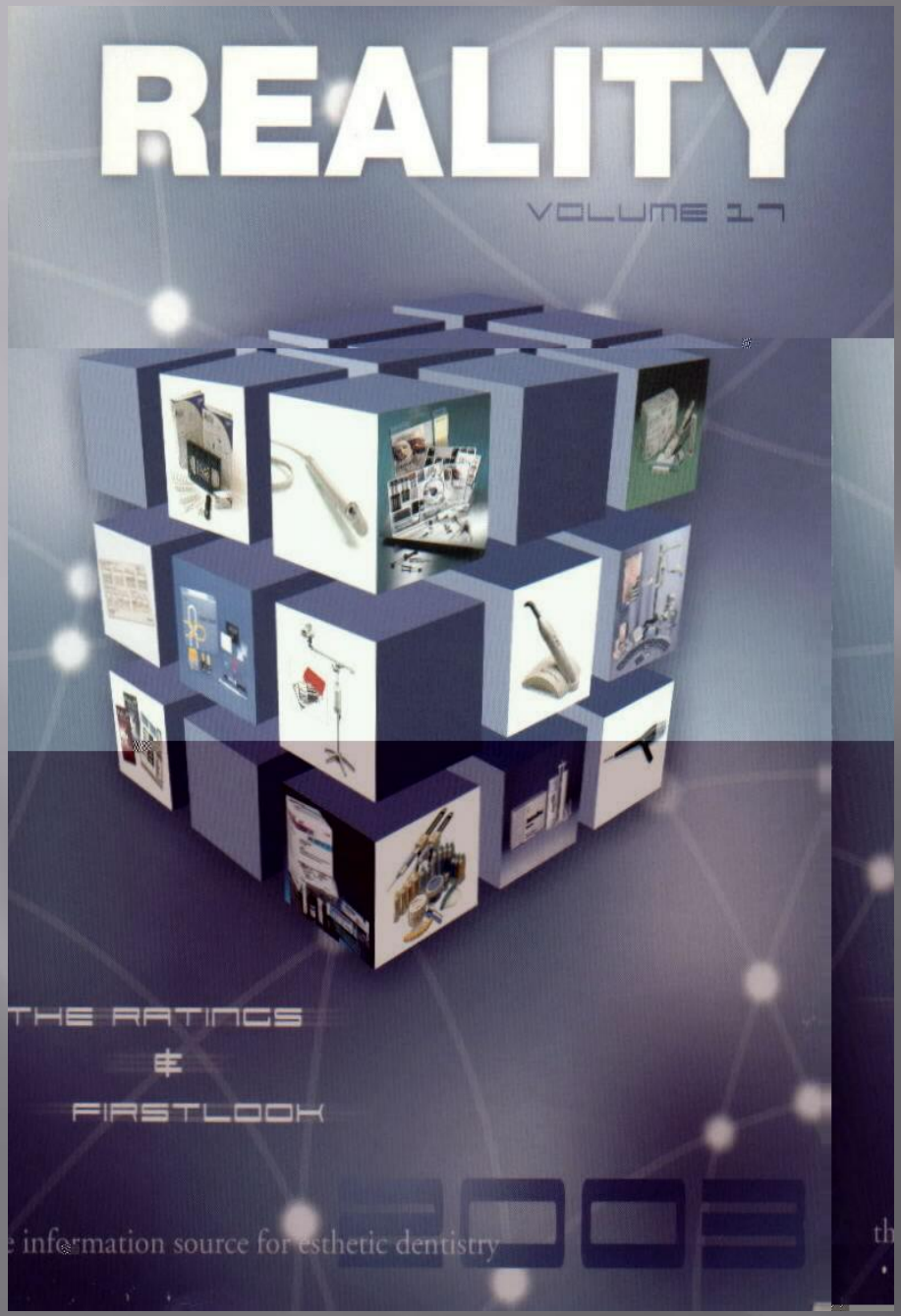
The Future of Dental Practice

- Rising school debt
- New technology costs to stay competitive
- Could be cost prohibitive unless in a group practice



Kostinsky M and Koenigsberg A. AGD Impact, July 2012, Vol. 40, No.7, 28-34


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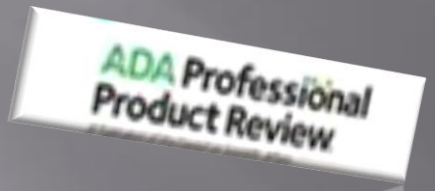
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FDA Panel Reviewing the Safety of Amalgam Fillings

From Shawn Watson, About.com Guide December 19, 2010

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An advisory panel consisting of experts in the fields of toxicology, risk assessment, epidemiology, and pediatric medical and dental specialties began a two day meeting in Washington, D.C. on December 14, 2010, to determine whether the U.S. Food and Drug Administration should reclassify dental amalgam, based on risk assessment and clinical data that demonstrated dental amalgam as a dangerous filling material; carrying a class III medical device classification. A class III medical device is classified as such, because there is insufficient information available regarding the effectiveness and safety of the device solely through the general or special controls sufficient for Class I or Class II devices. Simply put, class III medical devices pose the greatest risk to patients.

Why the sudden change in the heart FDA? Back in July, 2009 the FDA issued their final ruling on amalgam safety; granting amalgam class II medical device status. But on the contrary, it seems the FDA could quite possibly be changing their mind about amalgam. The meeting to reevaluate dental amalgam safety was, in part, done so because the agency had received several petitions raising various issues relating to the final rule and special controls. According to a press release dated June 2009 announcing the meeting, the FDA notes "The concerns raised include the adequacy of the risk assessment method used by the FDA in classifying dental amalgam, the bioaccumulative effect of mercury, the exposure of pediatric populations to mercury vapor, and the adequacy of the clinical studies on dental amalgam. In addition, a recent report on risk assessments issued by the National Academy of Sciences, titled "Science and Decisions: Advancing Risk Assessment, NAP 2009," proposes new approaches to conducting risk assessments. These may be some of the issues the agency asks the advisory committee to review."

I've said it once, and now I will say it again: Will we ever know the truth about amalgam?

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Comments

(1) Bernie Windham says: December 20, 2010 at 8:59 am

Hundreds of thousands of medical lab tests have confirmed that dental amalgam fillings are the largest source of mercury in most who have such fillings.
http://www.flcv.com/damspr1.html
Thousands of peer-reviewed studies have documented that mercury from amalgam, because of the high exposure and accumulation in major organs, commonly causes over 30 chronic health conditions http://www.flcv.com/adexa.html
And those who replace fillings and detox usually significantly improve from these conditions: http://www.flcv.com/hgrecovp.html & hgremove.html
But most don't know that amalgam makes the largest source of mercury in sewers and sewer sludge, resulting in high levels of mercury in water bodies and fish, and warnings to not eat fish http://www.flcv.com/damspr2.html

You may get answers like this!

(2) Steve says: December 22, 2010 at 12:52 pm

I am always nervous about the products being used on me by dentists. Especially in the past, I have had many bad experiences. Fortunately, now I go to James Snow DDS, and I don't have to worry about anything!

(3) Zhana Damask says: January 28, 2011 at 8:02 pm

Ever since I had amalgam fillings, I had brain damage. I've only recenlty lrned to spell again, but I still haf trubble.



http://www.afms.af.mil/decs



USAF Dental Evaluation & Consultation Service

Return to Equipment Evaluations

AMC-20CF Mobile Dental System (Aseptico) (PROJECT 2009-05) (5/10)

The AMC-20CF Mobile Dental System is a mobile dental cart designed for routine dental prophylaxis, restorative dentistry, and oral surgery procedures. Because it is self-contained, it is intended for use in austere environments. It has a 2-horsepower, oil-less compressor providing air to the unit for motor cooling, handpiece chip air, and water pressurization of the air/water syringe and water supply. The AMC-20CF has an internal vacuum system for high- and low-volume evacuation (i.e., suction) and an aluminum air storage tank. An E-type motor connection with fiber optics supports the use of a variety of high- and low-speed electric handpieces. Handpiece attachments are additional and if desired, are available from Aseptico. The electric motor control panel is mounted on the front of the AMC-20CF cart. Two air-turbine handpiece lines with connections and fiber optics are standard. A three-way air/water syringe, high-volume evacuation (HVE), low-volume evacuation (LVE) (i.e., saliva ejector), and a variable speed foot switch are included. It also has a 1-gallon waste container, amalgam separator, and a two-bottle self-contained 2-L water system. The waste container is emptied by activating an internal electric pump. Other features include a light-emitting-diode (LED) curing light and a Piezoelectric ultrasonic scaler integrated into the cart. The unit has a circular workspace countertop and a height-adjustable bracket tray mounted on a swivel arm. The AMC-20CF cart measures 36.5"H x 30.0"L (deep) x 23.5"W and weighs 194 pounds. A custom Mil-spec transport/storage case is provided, which weighs 210 pounds. The total shipping weight and volume of the unit and container are approximately 404 pounds and 38 cubic feet, respectively. The cart has resettable circuit breakers and is true dual-voltage, operating on 120 VAC, 50/60 Hz or 230 VAC, 50/60 Hz.

Manufacturer:
Aseptico
8333 216th Street S.E.
Woodinville, WA 98072
(800) 426-5913
(425) 487-3157
(360) 668-8722 FAX
www.aseptico.com

Suggested Retail Price:
$24,534.00 AMC-20CF Mobile Cart
- Dental unit
- MIL-Spec transport/storage case
- Supply Case
- One e-type electric motor
- One three-way air/water syringe
- One LED light curing wand
- One Piezoelectric scaler with scaler tips
- One metal bracket tray and mounting post
- One amalgam separator filter
- Power cords

Please visit our website and look through our evaluations.
Facebook page coming.

Thanks for your attention



William.j.dunn30.mil@mail.mil

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