

The FACTS About Bleaching

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The objective of this presentation is to increase your understanding of tooth whitening. We will do this by reviewing mostly clinical studies in the scientific literature that have been published. The presentation has been divided into six sections. They are:

Introduction	Pulpal concerns
Material concerns	Effectiveness of systems
Tooth concerns	Clinical Cases

Introduction

- Why learn about tooth whitening?
 - Restorative Dentistry is changing. “The more we cut tooth, the more we weaken tooth.”
- What are the two kinds of stains that develop?
 - Extrinsic—Stain, which is deposited on the outside surface. Whiteners will lighten calculus and the subsurface structure.
 - Intrinsic—Stain, which is incorporated into the tooth structure before or after eruption.
- What agent/s lighten teeth?
 - Peroxide is active agent. Found in Carbamide Peroxide. Breakdown:
10% CP=3% HP+7% Urea; HP=Oxygen + Water; Urea=Ammonia + Carbon Dioxide
 - Other agents that are used in tooth whitening: Chlorine Dioxide 0.004%; Perchlorate, Sodium Perborate
- How is color evaluated in the scientific literature?
 - Tooth color should be evaluated both subjectively and objectively. Subjectively shade guides are used. Objectively a colorimeter or spectrophotometer is used to measure L*, a*, b* and Delta E.
- How many systems are there for whitening teeth?
 - There are four major systems, three are At-home systems and one is an In-office system.
- What are the advantages and disadvantages of each system?
 - At-home custom tray bleaching
 - Advantages-Lower tooth sensitivity, more effective, less peroxide ingested (with reservoirs)
 - Disadvantages-Not predictable, takes longer.
 - At-home Over-the-counter bleaching
 - Advantages-Less expensive, no doctor visits
 - Disadvantages-Not as effective, higher concentration than recommended
 - There are four major types of over the counter products; Strips, Wraps, Tray-in-Tray and Paint-On
 - In-office bleaching-Professional
 - Professional
 - Advantages-Rapid tooth whitening; no gel ingested.
 - Disadvantages- Greater sensitivity; rapid reversal of tooth whitening; cannot use it on people who are taking medications that make them sensitive to light; possible “burning” of tissues

-What criteria are required for American Dental Association's Seal that a materials is "Safe" and "Effective"?

--American Dental Associations (ADA) first guidelines on safety and efficacy of bleaching agents were issued in 1994.

J Am Dent Assoc 125:1140-42;1994

--Efficacy standard was revised in 2006.

--The following product is accepted as safe and effective by the ADA.

Opalescence Whitening Gel **10% CP**

http://www.ada.org/ada/seal/adaseal_consumer_shopping.pdf May 2010

Material Considerations

-Is surface hardness and surface finish of dental materials compromised when using tooth whitening agents?

--Those values are material dependent and minimally affected by bleaching agents.

*Yap et al. Op Dent 27:137-141;2002

*Watanapayungkul et al. Op Dent 28:15;2003

-How long is the carbamide peroxide bleaching material active?

--Determined by ability to recover agent after it is placed.

---Rapid initial degradation of carbamide peroxide agent and then it slows down.

----87% of agent recoverable after 15 seconds *in vivo*

----66% of agent recoverable after 1 hour *in vivo*

----53% of agent recoverable after 2 hours *in vivo*

---- 31% of agent recoverable after 4 hours *in vivo*

----18% of agent recoverable after 6 hours *in vivo*

----6% of agent recoverable after 10 hours *in vivo*

Matis et al., J Am Dent Assoc 130:227-235;1999

-Does hydrogen peroxide degrade at the same rate as carbamide peroxide?

--HP degrades more rapidly than carbamide peroxide

---61% of agent recoverable after 5 minutes *in vivo*

---56% of agent recoverable after 10 minutes *in vivo*

---49% of agent recoverable after 20 minutes *in vivo*

---44% of agent recoverable after 30 minutes *in vivo*

---38% of agent recoverable after 45 minutes *in vivo*

---32% of agent recoverable after 60 minutes *in vivo*

Al-Qunaian et al., Op Dent 28:236-241;2003

Tooth Concerns

-Is there loss of adhesion with resin composites after bleaching?

--Study *in vivo* completed recently showed changes in shear bond strength returned to baseline values two weeks after bleaching.

*Metz et al., Op Dent 32(5) 427:2007

--The reason is "oxygen inhibition" that occurs with Bis-GMA resins.

-Is there a loss of enamel microhardness?

--Loss of microhardness of enamel has been reported with use of orange juice.

Ren et al., J Dent 37:424-437;2009

--Review of 55 scientifically valid studies on microhardness recently published.

Attin et al., Den Mat 25:143-157;2009

--Study *in vivo* shows no changes in microhardness after bleaching for two weeks.

*Metz et al., Op Dent 32(5) 427:2007

- Are there morphological changes on tooth surface?
 - Effect on enamel micromorphology when 38% HP or 35% CP were used in an *in vivo* study on teeth.
 - Cadenaro et al., Op Dent 33(2):127-134;2008
- Is there an increase in caries susceptibility?
 - Use of PF will make tooth more resistant to caries.
 - *Al-Qunaian, Op Dent 30:265;2005

Pulpal Concerns

- Does peroxide placed on the tooth during cause histological changes to the pulp?
 - Mild histological changes that were observed with 10% CP used overnight are considered to be reversible. No moderate or severe histological changes observed.
 - Gonzalez-Ochoa, J. Masters Thesis IUSD 2002
- Will discomfort occur during tooth whitening?
 - Patient may have one of two different kinds of discomfort: Tooth or Gingival sensitivity.
 - Tray alone causes tooth sensitivity in 15-20% of patients, add placebo agent and 20-30% report tooth sensitivity, add active agent instead of placebo and 55-75% report tooth sensitivity.
 - Haywood, J Dent Res 79:519(#3001);2000
- What can be done to reduce tooth and tissue sensitivity?
 - Tooth sensitivity
 - Potassium nitrate was used before bleaching to reduce tooth sensitivity. None had severe sensitivity.
 - Tay, J Am Dent Assoc 140:1245;2009
 - Ask patients about sensitivity to cold water when they brush their teeth. If sensitive to cold water, have them start brushing with potassium nitrate containing toothpaste before bleaching.
 - Tissue sensitivity
 - To reduce tissue sensitivity, have patient more effectively remove excess bleaching agent that comes out of the tray and have tray trimmed shy of cervical collar of gingiva.

Effectiveness of various concentrations and systems

- How effective are the In-office systems?
 - In-office bleaching outside tooth surface, Conventional (Power Bleaching)
 - In vivo* study of eight In-office bleaching systems: A pilot study (alphabetical order). Manufacturer's were invited to come observe use of their product.

Accelerated In-Office by Life Like	ArcBrite by Biotrol
Illumine by Dentsply	BriteSmile by BriteSmile
Niveous by Shofu	PolaOffice by SDI Industries
One Hour Smile by Den-Mat	Zoom! by Discus Dental

 - *Matis et al., Op Dent 28:324;2007
 - Light use did not improve the effectiveness of the In-office conventional system
 - Effectiveness evaluated with and without use of light.

Opalescence Xtra Boost	PolaOffice	Rembrandt Lighten Plus
LumaArch	Niveous	LaserSmile
Zoom!		
- CRA Newsletter 27(3):3;2003

- How effective are the At-home systems used with a custom tray?
 - All studies had at least **24 subjects**, bleached for **14 days** and **used reservoirs** in trays. Maxillary anterior teeth evaluated for color **objectively** and **subjectively**.
 - There are three other half-mouth design studies which taught us some important concepts.
 - 10% CP and 15% CP, overnight. 15% was no different than 10% at the end of one month
Matis et al., Quint Int 31:303-310;2000
 - 15% CP and 5.5% HP, ½ hour 2X daily showed equal concentrations produced equal results.
Panich, Masters Thesis, IUSD, 1999
 - 20% CP and 7.5% HP, 1 hour 2X daily showed 20% twice a day was no better than 10% overnight.
Mokhlis et al., J Am Dent Assoc 131:1269-1277;2000
 - We can now compare the In-office with three studies using 10% CP overnight in trays with reservoirs. 10% was twice as effective both subjectively and objectively than In-office products.
 - Do we need reservoirs in our trays?
 - Teeth in the side of the trays with reservoirs were statistically lighter, but not clinically lighter than teeth in side of the trays without reservoirs. More gel is ingested by patients using trays without reservoirs.
Matis et al., Op Dent 27:5;2002
- How effective are the Over-the-counter systems?
 - Different application product classifications compared
Gerlach, AADR 2010 Abs 828
- Effectiveness comparison of all the systems?
 - Nine studies with 26 products with both subjective and objective evaluations
At-home nighttime in tray with reservoir is most effective system
At-home daytime in tray is next most effective system
Over-the-counter is next most effective system
In-office systems is the least effective system
*Matis et al., Op Dent 34:230-235;2009

Clinical Cases

Tetracycline stain removal in a study accomplished in the Peoples Republic of China

- Not all tetracycline staining can be bleached, Cervical area stain removal most challenging to remove,
*Matis et al., Op Dent 31(6):643-651;2006

Never promise results but help patients understand the possibilities!

* Articles are available on Dr Matis' web site- www.bamatis.com