

# The Question-At-Home or In-Office Bleaching: Evidence Based Concepts to Empower Dental Professionals

Dr. Bruce A. Matis  
bmatis@iupui.edu

## Part 1 Introduction and In-Office Bleaching

### Introduction

- “Tooth shade is indeed the most important variable of the attractiveness of a smile.”  
Dunn et al., J Prosthodont 5:166;1996
- “It seems that everybody in America wants whiter teeth to make them feel younger and provide beautiful smiles and accompanying increase in self-esteem.”  
Christensen JADA 133:1277;2002
- To promote bleaching have posters, offer staff bleach and discuss color at restorative appointment.
- Listen, evaluate, discuss bleaching with patients. Beware of patients with unrealistic expectations.
- To determine if patients has bleached, check out color of cuspids. If light patient has bleached.
- Must make decisions on evidence-based dentistry, not opinions.
- Needs to be dental supervised.

### Goal is to remove stain

- Extrinsic—Stain, which is deposited on the outside surface.  
-Needs to be removed before bleaching so stain will not reattach to it.  
Collins et al., JDR 79:583;2000
- Intrinsic—Stain, which is incorporated into the tooth structure before or after eruption.
- Tooth whiteners penetrate tooth surface to affect the color.
- As we age our teeth become darker, more yellow and slightly more red.  
Odioso, Compendium 21:S35-S41;2000.

### In-Office Bleaching

- Advantages-Dentist controlled, -no gel ingested.
  - Disadvantages- Greater sensitivity, possible “burning” of tissues.
- Respondents’ satisfaction with In-office bleaching:  
Very satisfied-10%, Satisfied 32%, Unsatisfied 26%, Very unsatisfied 6%  
CRA Newsletter 25:2;2001
- Overview of all In-office products. Basic details from manufacturers on 14 systems.  
Freedman, Dental Products Report 36:82;2002
  - New generation In-office vital tooth bleaching; Part 2
- |                        |            |                        |
|------------------------|------------|------------------------|
| Opalescence Xtra Boost | PolaOffice | Rembrandt Lighten Plus |
| LumaArch               | Niveous    | LaserSmile             |
| Zoom!                  |            |                        |
- CRA Newsletter 27:1;2003
- In vivo* study of eight In-office bleaching systems: A pilot study (alphabetical order)
- |                                    |  |
|------------------------------------|--|
| Accelerated In-Office by Life Like | ArcBrite by Biotrol                      |
| Illumine by Dentsply               | BriteSmile by BriteSmile                 |
| Niveous by Shofu                   | PolaOffice by Southern Dental Industries |
| One Hour Smile by Den-Mat Corp     | Zoom! by Discus Dental                   |
- Franco and Al-Ammar, Masters Theses Indiana University 2003
- Tooth sensitivity with In-office agents is very difficult to control.
  - ADA article reports light augments tooth bleaching.  
Taraves, et al. JADA 134:167;2002
  - No difference between light and no light after two weeks.  
Kugel, et al. J Dent Res 82:B-125(#897);2003

- Opalescence Xtra Boost and Zoom! compared  
Gallagher, et al. J Clin Dent 6:219;2002
- The effect of light enhanced bleaching on *in vitro* surface and intrapulpal temperature rise.  
Zach & Cohen O Surg, O Med, O Path 19:515;1965  
Baik, et al. J Est Rest Dent 13:370;2001
- Effects of In-office tooth whiteners on hardness of tooth colored restoratives.  
Yap et al. Op Dent 27:137;2002
- Comparison of At-home and In-office bleaching  
Haywood, Dentistry Today, April 14, 2000
- ADA accepted In-office product is not as effective as ADA accepted At-home product.  
Zekonis et al. Op Dent 28:114;2003

**In-office agents should be used when patients want rapid tooth whitening or when they cannot wear a tray. When possible have patient use try whiteners to “boost” In-office whiteners.**

## **Summary and Conclusions**

- 1) Tooth shade is the most important element of patients’ perception of dental attractiveness.
- 2) Whiter teeth give us a more youthful image and an increase in self-esteem.
- 3) Must make dental decisions on evidence based facts, not opinion based theories.
- 4) When patients come in, Listen, Evaluate and Discuss bleaching with patient to make sure you can meet their expectations.
- 5) Dental cleaning is necessary to remove calculus, but not for bleaching efficacy.
- 6) Main purpose of whitening agents is to remove intrinsic staining.
- 7) Older patients are as satisfied as younger patients with the color of their teeth.
- 9) Isolation of soft tissues is a must with In-office bleaching.
- 10) In-office bleaches appear to all be about the same effectiveness
- 11) Light activation does not appear to increase lightening effect of bleaches.
- 12) Excessive length of light on one tooth can cause injury to the pulp.
- 13) High concentrations do not affect hardness of dental materials, hardness is material specific.
- 14) At-home is more effective than In-office bleaching with ADA accepted products

## **Part 2 At-Home Bleaching- The Good and the Bad**

### **At-Home Bleaching**

- Advantages-Less tooth sensitivity, patient monitored.
- Disadvantages-Not predictable, some sensitivity.
- Respondents’ satisfaction with At-home bleaching:  
Very satisfied-57%, Satisfied 38%, Unsatisfied 1.2%, Very unsatisfied 0.3%  
CRA Newsletter 25:2;2001
- 96% of dentists in US dispense and supervise At-Home bleaching.  
Dental Products 33:33;1999

### **Concentrations to use**

- Effectiveness of different concentrations of carbamide peroxide: An *in vitro* study has shown it just takes longer with lower concentrations.  
Leonard et al., Quint Int 29:503;1998
- American Dental Associations (ADA) first guidelines on safety and efficacy of bleaching agents were issued in 1994.  
J Am Dent Assoc 125:1140;1994

-The following products are accepted as safe and effective by the ADA.

<http://www.ada.org/p&s/seal> March, 2003

Colgate Platinum Daytime Professional Whitening System **10%**

Nite White Classic Whitening Gel **10%**

Opalescence Whitening Gel **10%**

Patterson Brand Tooth Whitening Gel **10%**

Rembrandt Lighten Bleaching Gel **10%**

#### Studies to review effectiveness of whitening agents

-All had at least **24 subjects**, bleached for **14 days** and **used reservoirs** in trays.

-All maxillary anterior teeth evaluated for color **objectively** and **subjectively**.

10% CP and 15% CP, overnight.

Mousa, Masters Thesis, IUSD, 1998; Matis et al., Quint Int 31:303;2000

15% CP and 5.5% HP, ½ hour 2X daily.

Panich, Masters Thesis, IUSD, 1999

20% CP and 7.5% HP, 1 hour 2X daily.

Mokhlis et al., J Am Dent Assoc 131:1269;2000

-Color reversal plateaus between 1 and 4 weeks post-bleaching.

-No difference between 10% and 15% four weeks post-bleaching.

- CP has same bleaching capacity as HP at comparable concentrations.

-10% CP overnight produces same lightness as 20% CP or 7.5% used 1 hr twice daily.

-There appears to be a “lightness potential” of a tooth.

-20% of patients experience large change, 50% moderate, 25% slight and 5% very little or none

Matis et al., Quint Int 29:555;1998

-Comparison of two bleaching regimens using 10% carbamide peroxide shows it took twice as long (14 days) with 2 hours per day as it did with overnight bleaching (7 nights).

Poore et al., JDR 78:250(#1159);1999

-Procedure for making tray:

Make plaster /stone model

Reduce to one inch high

Place resin using palm method

Vacuum form plastic (allow to droop 1 inch, cool model on platform)

Gross reduction on model

Finer reduction on model

Lift tray off model

Trim to cervical margin (indicated by transparent area)

Reverse directions on trimming

-Instructions for use:

Thoroughly brush teeth

Express agent into reservoirs

Seat tray and express excess

Brush off excess

Rinse twice with water

Remove residual gel

### Histological changes after bleaching

- Penetration of the pulp chamber by carbamide peroxide bleaching agents occurs very rapidly, within five minutes.  
Cooper et al., J Endo 18:315;1992  
Markovic et al., JDR 79:305;2000
  - Minor histological changes that were observed with 10% CP used overnight are considered to be reversible.  
Fugaro, J. Masters Thesis IUSD 2002
- Substance-P and Calcitonin Gene Related Peptide neuropeptides, which are precursors to inflammation were not elevated subgingivally during overnight bleaching with 10% CP.  
Fugaro OJ Masters Thesis IUSD 2002

### Sensitivity

- About 50% of the patients will have some tooth sensitivity, only 10% will be severe  
Matis et al., Quint Int 29:555;1998
- 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 JDR 79:519(#3001);2000
- Greater sensitivity will be caused by 16% CP compared to 10% CP  
Leonard et al. J Esthet Rest Dent 14:358;2002
- To reduce tooth sensitivity:  
Have patient use agent with potassium nitrate after bleaching for 10-30 minutes.  
Have patient use agent less often.  
Have patient wear the tray for a shorter period of time.  
Haywood, Quint Int 32:105;2001
- To reduce tissue sensitivity, have patient remove excess bleaching agent that comes out of the tray and have tray trimmed shy of cervical collar of soft tissue.
- Sodium Lauryl Sulfate, a foaming agent in toothpaste, may cause gingival irritation or aphthous ulcers

### Effects on teeth

- 10% CP has shown to cause minimal changes with *in situ* studies in enamel.  
Araujo et al. 15:166;2003
- Adhesion of resin composite to bleached enamel is lower for up to two weeks after bleaching.  
Titley et al., J Endo 19:112;1993

### Degradation

- 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;1999
- Causes of loss of recoverable agent are a combination of 1) physical loss of agent, 2) product degradation, 3) anti-oxidant degradation, 4) Increased temperature and 5) absorbent tooth  
Matis, Compendium 24:254;2003

- No clinical difference in degradation of various concentrations of CP or with or without reservoirs.  
Matis et al. Op Dent 27:12;2002
- Trays without reservoirs have physical loss of product that is ingested.
- Degradation of hydrogen 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;2003
- With short term use no difference in clinical lightening of teeth with or without reservoirs  
Matis et al. Op Dent 27:5;2002
- Caries susceptibility does not increase with bleaching  
Al-Qunaian, Op Dent (in press)  
Kraft et al. J Dent Res 82:b-78(#523);2003
- How long does tooth whitening last?  
Leonard et al. J Esthet Rest Dent 15:142;2003
- “All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy.” Paracelsus (1493-1541)
- Daily exposure should not exceed 10mg. Includes safety factor of 100.  
Dahl and Becher J Dent Res 74:710;1995
- In the past, it was thought that bleaching agents may potentiate the harmful effects of tobacco.  
Weitzman J Perio 57:685;1986
- Excellent article entitled “Biological Properties of Peroxide-containing Tooth Whiteners” is available.  
Li, Food and Chemical Toxicity 34:887;1996

### Over the counter products

- Most research on Whitestrips and Simply White have been accomplished by manufacturers.
  - They lighten but not as well as tray bleaching  
Li et al. Compendium 24:357;2003
- Many products are appearing on the shelves with various concentrations of HP and CP  
Matis, Compendium 24:254;2003
- The whitening effect was very very slow using whitening toothpastes.
  - Whitening toothpaste decreased reversal of color that happens after vital tooth bleaching.  
Matis, Indiana Dent J 77(3):27-32;1998

### Summary and Conclusions

- 1) 98% of patients are “very satisfied” or “somewhat satisfied” with At-home tooth bleaching.
- 2) Lower concentrations just take longer to lighten teeth a comparable amount.
- 3) Only 10% carbamide peroxide bleaching agents are accepted as “safe” and “effective”.
- 4) Carbamide peroxide and hydrogen peroxide lighten at the same rate in short periods of time.  
Carbamide peroxide is more effective in longer periods of time.
- 5) Daytime bleaching for one hour a day takes twice the concentration to obtain the same effect as overnight bleaching.

- 6) 10% CP has been shown histologically and immunologically to cause very minor and reversible changes in the pulp.
- 7) Tooth sensitivity can be reduced by using potassium nitrate, reducing frequency of bleaching or bleaching during the daytime.
- 8) Tissue sensitivity can be reduced by trimming the tray length and/or removing the product from off the tissues.
- 9) Resin restorations should not be placed for up to two weeks post-bleaching because of reduced bond strength.
- 10) After two hours about 50% of the initial carbamide peroxide is remaining in trays when reservoirs are used. Less amount of active agent is remaining if reservoirs are not used.
- 11) Patients will ingest 50% more peroxide when trays are used without reservoirs.
- 12) Not a lot of active agent is used during the bleaching process.
- 13) Caries susceptibility does not increase with bleaching.
- 14) Reservoirs are needed for overnight bleaching.
- 15) After 20 minutes about 50% of the initial active hydrogen peroxide is remaining in trays.
- 16) Whitening toothpastes have the ability to slow reversal of tooth whitening.

### **Part 3 Clinical Cases: The Test is in the Taste**

- 1) 67 year old female with light crown tooth #12, age caused discoloration of natural teeth, bleached 6 weeks.
- 2) 4 year old who fell down, traumatizing deciduous central incisors, which were bleached for a total of 47 hours.
- 3) 36 year old female, trauma caused discoloration of tooth #8, no periapical pathology, bleached 6 weeks.
- 4) 28 year old male, semi-professional football player/student, canal in tooth #9 calcified and tooth discolored, bleached for 5 weeks, rebleached after 9 months.
- 5) 19 year old male, endodontically treated #8, placed glass ionomer plug, bleached internally and externally for 2 weeks each.
- 6) 62 year old female, bleached mandibular teeth 6 weeks.
- 7) Hypocalcified area was bleached for 14 days, white spot lightened rapidly then returned to original color after cessation of bleaching.
- 8) Unhappy person who probably overbleached her teeth.
- 9) Unhappy person who was unsatisfied with vital bleaching and decided on veneers.

#### Fluoride staining- a post eruptive stain

Remove fluoride staining in enamel three ways:

Microabrasion with HCl acid, beaching and/or use bur to remove stain

Croll, JADA 128:S45-S50;1997

#### Tetracycline staining- a pre-eruptive stain

Traditional tetracycline staining classification

Jordan and Boksmann, Comp Cont Ed 5(10):803-808;1984

New classification for tetracycline stained teeth and total percentage of teeth in each class:

- 1) Homogenous staining (50%)
- 2) Incisal staining (14%)
- 3) Cervical staining (19%)
- 4) Bands of staining (17%)

Professionally rated esthetical results of six months treatment of tetracycline staining:

	Homogeneous	Incisal	Cervical	Bands
Excellent	55%	86%	10%	56%
Satisfactory	41%	0	70%	33%
Unsatisfactory	4%	14%	20%	11%

Matis et al. Quint Int 33:645;2002

#### Clinical Cases

- 1) Right 15%--Left 20%
- 2) Right 10%--Left 20%
- 3) Right 20%--Left 10%
- 4) Right 10%--Left 15%

### **Summary and Conclusions**

- 1) Teeth can be lightened to match a crown that has been placed previously many years ago.
- 2) In discolored asymptomatic teeth without periapical pathology bleach without root canal treatment.
- 3) In nonvital bleaching seal orifice to canal and leave open during bleaching. Seal with glass ionomer.
- 4) Anytime dentin is dark bleaching will work, but it takes longer.
- 5) Light spots in some teeth turn lighter very rapidly but reverse to original lightness.
- 6) Other teeth develop white spots during bleaching which indicate less dense enamel areas. These white spots disappear after bleaching is discontinued.
- 7) Use bleach as long as teeth continue to lighten.
- 8) Teeth will rebleach 5 times faster than then initially bleach.
- 9) Staining depends on stain quotient of patients. Usually lasts 6 months to 3 years.
- 10) Some teeth with tetracycline staining may take longer than six months to lighten, especially in the cervical area.
- 11) More than 50% of the tooth lightening that occurred did so in the first month.
- 12) Few of the subjects had sensitivity. Most of the sensitivity was on the sides using 15% and 20%.
- 13) Ten percent CP lightened teeth almost as rapidly as the 15% and 20%.

**End of Course**    **Thank you for your attention**

**Questions for Dr Matis:**

## **Questions patients often ask and their answers**

How long do I use the product?

Usually from 10-14 days. (On some teeth that are yellow due to aging, I have used the agents for 2 months. Use it as long as teeth continue to lighten. Dr. Haywood has used agents for 12 months on tetracycline stained teeth.)

When will I notice some effect?

In about three days.

What if I cannot wear the tray all night?

Wearing the tray is usually not a problem. The tray is like a contact lens; it stays in place with the gel. Some people will salivate more the first couple of nights. If you find you cannot sleep with it through the night we will have you wear it in the morning or evening for a couple of hours. That way will just take a little longer.

What happens if I miss a day?

No problem, just wear it the following evening.

How long does the lightness from the bleaching last?

It usually lasts from one to three years. In some patients there is no reversal. (They very seldom return to the original discoloration, except for smokers. Smokers often return to their original discoloration.)

Can I rebleach?

Yes, use the same tray. The product is good for 18 months in the refrigerator.

How fast does rebleaching work?

You will need to bleach one day for each week you originally bleached.

I am expecting, can I use At-Home whitening agents?

We recommend you not use it until you have completed nursing. (There is no evidence it would harm the newborn, but no studies have been conducted to determine if it would harm the offspring. This is an elective procedure so it is better to wait.)

Do I bleach both arches at the same time?

No, first bleach the maxillary arch. (Patients do not sense teeth are lightening if both arches are bleached at the same time.) You will have less chance of TMD discomfort if you bleach one arch at a time.

Is it true that laser bleaching is more effective than at-home bleaching?

No. (The American Dental Association has stated that laser bleaching is not more effective than at-home bleaching.)

How young can you begin bleaching?

Dr. Haywood has bleached patients as young as four when there has been a need for it.

Will it damage my teeth or overall health?

There are five agents, which have been accepted as "safe" and "effective". If you use any of those products as recommended, they have been shown not to harm the teeth or your overall health.

Will it damage my crowns or fillings?

No, it will not damage fillings or crowns. It will not lighten them either. It will discolor some temporary filling materials.