

Current Protocol for Successful Treatment of Difficult Whitening Cases

KöR Whitening offers effective noninvasive treatment for tetracycline staining case

Andrew Green, DDS

Some stains, such as those from fluoride (fluorosis) and tetracycline, are extremely resistant to conventional whitening techniques.¹⁻³ They are more inorganic than other sources of tooth discoloration, meaning that both types of stains are extremely difficult to convert.^{1,4,5} This is because both fluoride and the tetracycline family of antibiotics bind so strongly to the hydroxylapatite (hydroxyapatite) molecules^{1,4-6} that comprise enamel, dentin, and bones that they actually become part of the chemical structure.⁷

Due to their nature, these stains have previously been nearly impossible for dental professionals to whiten successfully. No separate organic stain and pigment molecules exist in these cases, and typical whitening systems cannot sufficiently penetrate the microstructure of teeth with bleaching agents to provide excellent esthetic results.

The KöR Whitening System (Evolve Dental Technologies Inc., www.korwhitening.com) closely follows the dictates of physics and chemistry necessary to provide predictable effectiveness for these extremely difficult cases. How deeply and how long peroxide bleaching factors penetrate the microstructure of teeth are two of the primary determinants of how successful and predictable whitening will be.⁸



ANDREW GREEN, DDS

Private Practice
Bay City, Michigan

Studies have confirmed that whitening gel in conventional whitening trays is only aggressively active for 20 to 30 minutes,⁹ which is due to leakage of saliva¹⁰ and sulcular fluid¹¹ into the whitening trays. Both saliva and sulcular fluid are strongly concentrated with the natural antioxidant enzyme glutathione peroxidase, which destroys peroxide on contact.^{11,12}

KöR-Seal™ Whitening Trays are designed to seal out salivary and sulcular fluid contamination, thereby greatly extending the effective activity time of the whitening gel—multiple hours instead of minutes.

All whitening gels are unstable chemicals.^{10,13} This instability is beneficial because it allows the whitening gel to rapidly break down in the mouth, releasing bleaching factors to whiten teeth. However, this same instability is also detrimental because the whitening gel starts degrading immediately after manufacture if not refrigerated.¹³ Heat—even

room temperature—encountered during storage and shipping results in significant premature breakdown of the peroxide before it is even received by the dental practice.^{13,14}

KöR Whitening is the first complete whitening system to be constantly refrigerated from the moment of manufacture until it is received cold-packed by the dental practice. This offers several benefits:

- Chemical stabilizers are not necessary and are not used. This results in even more instability and greater breakdown when placed in the mouth.
- Chemical stabilizers are greatly responsible for sensitivity during whitening because they increase the osmolarity of the whitening gel by as much as 11 times, and therefore, there is 11 times more pull on dentinal tubular fluid.¹⁵ Without chemical stabilizers, KöR gels have as little as 1/11 the osmolarity, resulting in significantly less sensitivity.



FIG. 1

(1.) Patient presented with severe tetracycline staining.

Clinical Brief

- KöR products are always received at virtually the same effectiveness as the day of manufacture.

Additionally, the KöR in-office Hydremide® Peroxide is the first whitening gel in a Tri-Barrel™ delivery system. This enables the chemistry to be separated into three barrels instead of only two (dual-barrel systems). There are many chemicals that cannot be mixed together until ready for use. The Tri-Barrel delivery enables the addition of more ingredients, thereby resulting in a more sophisticated, highly effective formulation for all whitening cases.

Case Presentation

A 50-year-old male patient presented to the

author's practice with a chief complaint of severe tooth discoloration attributed to the use of tetracycline in his youth (Figure 1).

During the examination, the patient discussed how he had spent his entire life hiding his teeth, and stated he was finally ready to do something about it. The patient had been previously informed by numerous dentists that his teeth could not be whitened, and the only way to correct the color was to cover the teeth with porcelain. The patient presented to the author's practice expecting invasive porcelain cosmetic treatment.

Given the overall good oral health of this patient and because of the aggressiveness of the tooth preparations necessary with this intensity of tetracycline staining,¹⁶ the author felt porcelain restorations were not the first option to consider.

The author is a small-town dentist who had struggled in the past with the common

limitations of whitening products and frequently researched the availability of more effective and predictable teeth-whitening systems. This research revealed one system that repeatedly demonstrated superior results over a broad spectrum of cases—the KöR Whitening System. The author determined KöR was the best solution for this case, and discussed the advantages and requirements of the KöR Whitening system with the patient to properly manage his expectations.

Clinical Protocol

The KöR-Seal Whitening trays are unique whitening trays fabricated with extreme precision, fitting nearly as well as crown-and-bridge restorations (Figure 2 and Figure 3). Due to the severity of tetracycline staining, the author elected to send the impressions for fabrication of the trays to the KöR Lab for the best possible precision of fit and seal.

Upon return of the KöR-Seal Whitening Trays, the patient presented to confirm the fit and seal of the whitening trays. The facials of the teeth to be whitened were then polished with a standard flour of pumice to remove any plaque.

The KöR Ultra-T kit is specifically designed to treat tetracycline staining. Unlike other KöR kits, which involve only at-home whitening or at-home whitening followed by an in-office whitening visit, Ultra-T uses a “jump-start” application prior to at-home whitening, using KöR Dual Activated, Tri-Barrel™ 13% Hydremide® Peroxide. This gel was placed into the KöR-Seal Trays and over the teeth for 20 minutes. Two consecutive 20-minute applications were completed. No retractors or paint-on gingival barrier were necessary.

The application of this gel is referred to as the “conditioning visit.” The 13% hydremide peroxide is specifically formulated to initiate the internal cleansing of the tooth microstructure, referred to as “oxygenation.” This enables the following at-home whitening gels to penetrate tooth microstructure more quickly.

The patient was then given his KöR at-home whitening kit, including 16% KöR-Night Extended-Release Carbamide Peroxide, KöR-Seal Whitening Trays, separate KöR Desensitizer to be applied to the teeth daily, and an instructional DVD for reference.

The patient wore the whitening trays nightly and applied the desensitizer every morning. The normal protocol with KöR Whitening is 2 weeks of nightly whitening at home, which, depending on the kit selected, may or may not



FIG. 2



FIG. 3

(2. AND 3.) Examples of precisely fabricated upper and lower KöR-Seal Whitening Trays. (4.) Two-week progress check. (5.) Six-week progress check.



FIG. 4



FIG. 5

be followed by an in-office KōR Whitening visit. However, KōR instructions specify 6 to 8 weeks of at-home whitening for the treatment of tetracycline staining.

The patient was seen every 2 weeks by the author to evaluate the progress and to provide the patient with more whitening gel and desensitizer. After the initial 2-week treatment, the patient presented for his progress check (Figure 4). At each successive progress check, the improvement continued to be impressive (Figure 5).

After whitening nightly at home for the prescribed 8 weeks, the patient presented for his in-office whitening visit, at which time KōR Dual Activated, Tri-Barrel™ 34% Hydremide® Peroxide, KōR Retractors, and KōR Dam paint-on gingival barrier (all included in the whitening kit) were utilized and applied.

After three consecutive 20-minute applications, the whitening gel, paint-on dam, and retractors were removed. The final whitening result was very impressive, and the patient was extremely pleased (Figure 6). The patient felt no tooth sensitivity at all throughout the entire whitening process.

Four weeks after the final whitening visit, the patient again presented for evaluation (Figure 7). The whitening results surpassed the expectations of the author and patient, who stated that the whitening was “the best money” he had ever spent, and that it had changed his life for the better.

References

1. Cloud JJ, Weibling B. Whitening challenges: tetracycline staining and fluorosis. *Dent Today*. 2009; 28(12):82, 84-85.
2. Matis BA, Wang Y, Eckert GJ, et al. Extended bleaching of tetracycline-stained teeth: a 5-year study. *Oper Dent*. 2006; 31(6):643-651.
3. Loyola-Rodriguez JP, Pozos-Guillen Ade J, Hernandez-Hernandez F, et al. Effectiveness of treatment with carbamide peroxide and hydrogen peroxide in subjects affected by dental fluorosis: a clinical trial. *J Clin Pediatr Dent*. 2003; 28(1):63-67.
4. Skinner HC, Nalbandian J. Tetracyclines and mineralized tissues: review and perspectives. *Yale J Biol Med*. 1975; 48(5):377-397.
5. Triller M. [Fluoride, a preventive agent of caries: mechanisms, sources, risks]. *Arch Pediatr*. 1998; 5(10):1149-1152.
6. Greenwall L. *Bleaching Techniques in Restorative Dentistry—An Illustrated Guide*. 1st ed. London, England: Thieme Medical Pub; 2001:2-4.
7. Al-Jawad M, Addison O, Khan MA, et al. Disruption of enamel crystal formation quantified by synchrotron microdiffraction. *J Dent*. 2012; 40(12):1074-1080. doi:10.1016/j.jdent.2012.08.020.
8. Heymann HO. Tooth whitening: facts and fallacies. *Br Dent J*. 2005; 198(8):514.
9. Christensen GJ. At-home tooth bleaching, state-of-art 2001. *Clinical Research Associates (CRA) Newsletter*. 2001;25(2):2-4.
10. Margeas RC. New advances in tooth whitening and dental cleaning technology. Academy of Dental Therapeutics and Stomatology Dental Continuing Education website. www.ineedce.com/courses.aspx?cat=Tooth+Whitening. Accessed April 15, 2015.
11. Patel SP, Pradeep AR, Chowdhry S. Crevicular fluid levels of plasma glutathione peroxidase (eGPx) in

periodontal health and disease. *Arch Oral Biol*. 2009; 54(6):543-548. doi:10.1016/j.archoralbio.2009.02.002.

12. Greabu M, Totan A, Battino M, et al. Cigarette smoke effect on total salivary antioxidant capacity, salivary glutathione peroxidase and gamma-glutamyltransferase activity. *Biofactors*. 2008; 33(2):129-136.

13. de Martini Bonesi C, Ulian LS, Balem P, Angeli VW. Carbamide peroxide gel stability under different temperature conditions: is manipulated formulation an option? *Braz J Pharm Sci*. 2011; 47(4):719-724. doi:10.1590/S1984-82502011000400008.

14. Freire A, Archegas LR, de Souza EM, Vieira S. Effect of storage temperature on pH of in-office and at-home dental bleaching agents. *Acta Odontol Latinoam*. 2009; 22(1):27-31.

15. Pashley DH, Tay FR, Haywood VB, et al. Dentin hypersensitivity: consensus-based recommendations for the diagnosis & management of dentin hypersensitivity. *Inside Dentistry*. 2008; 4(suppl 9):S1-S37.

16. Lowe E, Rego N, Rego J. A delayed subopaquing technique for treatment of stained dentition: clinical protocol. *Pract Proced Aesthet Dent*. 2005; 17(1):41-48, quiz 50.

FOR MORE INFORMATION, CONTACT :

Evolve Dental Technologies

866-763-7753

www.korwhitening.com

Circle xx on Reader Service Card



FIG. 6

(6.) Immediate post-treatment result after completion of 8-week protocol; comparison to pretreatment photograph (Figure 1) demonstrates dramatic improvement. (7.) Four-week post-treatment evaluation.



FIG. 7