

# Efficacy of carbamide peroxide and sodium perborate as bleaching agent in non-vital discoloured teeth-A Review

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**Abstract-** The objective of this paper was to bring together and summarize the available information on efficacy of carbamide peroxide and sodium perborate as bleaching agent in non vital discolored teeth. This review article will give an overview of nonvital bleaching techniques, materials and regimens used, bleaching protocol and side-effects as esthetic treatments for discoloured teeth has been showing a boom recently in the field of dentistry.

**Keywords:** Discoloration, Non vital bleaching, carbamide peroxide, sodium perborate.

## Introduction

Tooth discoloration creates a wide range of esthetic problems. The methods available to treat discolored teeth range from removal of surface stains, bleaching, tooth whitening techniques or operative techniques to camouflage the underlying discoloration, such as veneers and crowns.<sup>(1)</sup> The demand for tooth whitening has improved dramatically over the past years with the resulting improvement of many new whitening products from as many different company. It seems that the success of tooth whitening depends mainly on the combination of the peroxide concentration and the application period.<sup>(2)</sup> The use of a variety of bleaching techniques has attracted much interest from the profession, as these techniques are non-invasive. Current strategies may be classified as either professionally implemented or patient implemented.

Dental tissue sensitivity during bleaching is a common side effect and varies from patient to patient. Usually, the sensitivity is reversible and resolves itself over time or with the help of a desensitizing agent. Demineralization of dental structures has been reported due to the low pH of some of these materials. The incidence is higher after in-surgery bleaching with hydrogen peroxide preparations and/or heat. Some degree of mild, transient tooth sensitivity is common after home bleaching with the incidence of hypersensitivity as high as 38–78 per cent after 6 weeks of 10% carbamide peroxide bleaching. The exact mechanism of post-bleaching tooth sensitivity is still unclear.

In vitro look at said that hydrogen peroxide penetrates teeth and dentine, and enters the pulp chamber at some point of bleaching therapy. Penetration is higher in restored than unrestored teeth, and the level of penetration is proportional to the concentration of hydrogen peroxide in the bleaching gel.<sup>(3)</sup> Internal enamel bleaching is a minimally invasive, conservative, quite simple, effective, and occasional price technique within the remedy of discolored endodontically handled teeth. There are several internal tooth bleaching techniques, the most common being the walking bleach first described by Spasser in 1961. Other techniques include the thermocatalytic technique and inside outside techniques. The walking -bleach, or conventional technique consists of inserting the bleaching agent into the closing the access cavity with temporary filling, and the dentist refreshing the bleaching agent on a weekly basis until a satisfactory color is achieved<sup>(4)</sup>

## Bleaching agents

Peroxides can be classified into organic and inorganic. The most commonly employed bleaching agents are Hydrogen peroxide, Sodium perborate, Carbamide peroxide. Hydrogen peroxide used in dentistry as a whitening agent ranges in concentration between 5 and 35%. Sodium perborate is a stable, white powder, normally supplied in a granular form that has to be ground into a powder before using the powder is water-soluble. When mixed into a paste with Superoxol, this paste decomposes into sodium metaborate, water, and oxygen. Carbamide Peroxide is also known as urea hydrogen peroxide. Its concentration ranges from 3 to 45% depending on at-home and in-office bleach. The most popular commercial preparations have a concentration of 10% carbamide peroxide. The use of tooth bleaching agents has improved recently, with carbamide peroxide (CO(NH<sub>2</sub>)<sub>2</sub>.H<sub>2</sub>O<sub>2</sub>) being a generally used bleaching material. Carbamide peroxide is commonly used as a tooth bleaching agent at a concentration of 6–35% w/v (H<sub>2</sub>O<sub>2</sub> 2–12% w/v) which in water/saliva produces hydrogen peroxide and urea. Hydrogen peroxide is a strong oxidant that produces oxygen free radicals and the perhydroxyl ion (HO<sub>2</sub><sup>-</sup>) to chemically change (bleach) stained (coloured) organic molecules (chromophores)<sup>(3)</sup>. Vital tooth bleaching with 10% carbamide peroxide is a safe, well-established process for the remedy

of floor and intrinsic tooth-staining. A similar new manner of peroxide utility is provided with Whitestrips, skinny polyethylene strips of foil protected with a bleaching agent gel containing 5.3% hydrogen peroxide.

## Methodology

Author	Year	Results	Conclusion
De vasconcelos Cunha Borges	2012	16%cp produced the greatest colour change	The results indicate that the CPP ACP paste did not affect tooth whitening efficacy.
Rt basting Flb amaral	2012	The effectiveness of and Tooth sensitivity to 10%and20%cp home use bleaching and 35%and 38%HP in office bleaching agents.	The use of 10%cp and 20%cp home use and 35%and 38%hp in office treatment have the same effectiveness in bleaching teeth.
Sr Grobler A majeed R Hayward	2011	Efficacy of two different 10%cp bleaching products	Rebleaching after 6 months is not necessary.
M bizhang R seemann	2006	The demineralization effect of 2 different bleaching procedures on enamel surface with and without the post treatment application of fluoride was determined.	The study suggest that post treatment fluoride application prevents mineral loss in bleached enamel surfaces.
Dj manton R bhide	2008	The addition of tooth mousse to peroxide or the application of ozone with peroxide did not significantly affect the bleaching effectiveness compared with peroxide alone.	The tooth mousse may be applied concurrently with bleach and not reduce bleaching effectiveness
B A Matis M.A Cochran	2007	Evaluated tooth whitening and sensitivity with 15%CP gel with potassium nitrate and fluoride and 16%CP with amorphous calcium phosphate.	15%CP exhibited greater bleaching potential but exhibited no difference in sensitivity.

## Discussion

Tam et al compared 10% carbamide peroxide (CP) and 10% CP with potassium nitrate and fluoride (PF). A split-mouth study design was used on 21 subjects to determine the whitening ability and sensitivity from those two agents. Tam concluded that the addition of PF made no difference in the whitening ability of 10% CP but noted that it significantly reduced the amount of sensitivity. A examine conducted by Giniger et al compared the differences between a 16% CP product and a 16% CP product with ACP added. These authors determined that the addition of ACP caused a statistically significant decrease in sensitivity and a statistically significant increase in whitening ability.<sup>(5)</sup>

## Casein phosphopeptide-Amorphous calcium phosphate

Casein phosphopeptide-amorphous calcium phosphate (CPP-ACP, Recaldent™) is a nanocomplex of calcium ions, phosphate ions and hydroxide ions stabilized through casein phosphopeptides. The CPP-ACP nanocomplexes release calcium ions, phosphate ions and hydroxide ions at the tooth surface, thereby reducing demineralization and enhancing remineralization. CPP-ACP has been shown to remineralize white spot lesions of enamel and to slow progression of

carries in a randomized, controlled clinical trial. Further, the use of CPP-ACP has also been suggested to reduce tooth sensitivity and to improve the aesthetics of hypomineralized and stained enamel by promoting mineralization which improves lustre and translucency of the treated tooth enamel<sup>(3)</sup>. This nanocomplex acts as a calcium and phosphate reservoir that attaches itself to dental plaque and tooth surfaces. This nanocomplex acts as a calcium and phosphate reservoir that attaches itself to dental plaque and tooth surfaces. In this sense, CPP-ACP might rapidly obliterate the dentinal tubules by rapid precipitation of calcium phosphate crystals on the surface and also inside the dentinal tubules, increasing remineralization and decreasing sensitivity<sup>(6)</sup>.

Numerous clinical studies on varied 10 carbamide peroxide products revealed good tooth bleaching results which are claimed to last for times. Still, the decolorizing effect shows some relapse in color after the conclusion of active bleaching treatment.

In a clinical study, Matis et al. Reported a significant whitening of teeth following at-home bleaching with 10 carbamide peroxide for 14 days. The average relapse in decolorizing effect was 45 after 6 months, but the teeth were still significantly whiter as compared to the birth( prebleaching

Swift et al. Set up that cases who used 10 carbamide peroxide gel nightly for 2 weeks showed a 7 unit enhancement( Vita Lumin shade companion) that dropped with 28 after 6 months which is relatively analogous to the 27 drop set up for Nite White ACP in this study. Leonard et al.( 9) revealed that the decolorizing effect caused by 10 carbamide( Nite White Classic; 8 – 10 h/ d for 14 days; A3 or darker) reported 5 units lighter teeth after 3.8 times. In three different papers( 26 – 28) on 10( C1 or darker teeth) carbamide peroxide which was applied for 2 h/ day for 3 weeks, a  $\Delta E_{ab}^*$  value of 4.1 was reported one week after treatment, a value of 3.8 after 6 months and a value of 4.3 after one time. From these  $\Delta E_{ab}^*$  values, it can be derived that there was no color relapse indeed after a one-time period which is in discrepancy to this study.

According to Dos Santos Medeiros MC et al where Opalescence PF 10 was also used overnight, but in discrepancy to this study applied for 21 days the lightness first increased with 3 units from A2 to A1 with no relapse after 21 days, 30 days, or 180 days. Again the no relapse is in discrepancy to this study. A study on a 10 carbamide peroxide whitener( 25) on A2 or darker teeth when treated overnight( 8 hours) for two weeks showed a  $\Delta E_{ab}^* = 6.57$  after treatment with a 24 relapse after a 3-month period.

Crews and others set up that the quantum of calcium and phosphate in enamel increased after whitening with carbamide peroxide. Other studies have set up a slight revision in the enamel outside after whitening. Still, there are also studies that didn't find any aspects of destruction of the bleached enamel outside<sup>(1)</sup>.

Studies have been done to determine enamel hardness and set up that no change in enamel hardness occurs after 10 carbamide peroxide treatment. Results of profilometric analysis are also clashing. McGuckin and others observed a slight increase in outside roughness, 26 whereas Hunsaker and others and Gürkan and others reported no exterior roughness.

Controversially, Cimilli and Pameijer<sup>30</sup> reported that the usage of 10 carbamide peroxide on enamel for 6 hours/ day for 5 or 10 days dropped the Vickers hardness at 110  $\mu\text{m}$  below the enamel outside. Attin and others<sup>16</sup> measured the Knoop hardness of enamel after the use of 10 carbamide peroxide. They observed a reduction in exterior microhardness. Still, the findings of both studies showed significant mineral loss on the external enamel layers.

Tooth sensitivity is the maximum not unusual place unfavourable aspect impact of bleaching. It is associated with the boom in teeth and dentin permeability and the resultant clean passage of the peroxide thru the tooth and dentin to the pulp. Although the remarkable majority of human beings are capable of tolerate enamel whitening, sensitivity associated with enamel whitening is a vital problem. Studies have proven that the superiority of sensitivity throughout home-use or in-workplace bleaching remedies varies from 0% to 100% of individuals. Bernardon and others<sup>21</sup> said a better charge of teeth sensitivity for the in-workplace bleaching remedy in comparison with the home-use technique, even though different research confirmed comparable ranges of teeth sensitivity while evaluating each strategies. This indicates that teeth sensitivity isn't always handiest associated with the excessive peroxide awareness used within the in-workplace strategies however is likewise a symptom that can range significantly from man or woman to individual. Schulte and others<sup>29</sup> located that sensitivity changed into extreme sufficient to reason 14% of the individuals to stop the home-use bleaching 10% CP agent, despite the fact that different research confirmed no volunteers who withdrew from the look at whilst the use of the home-use agents. In this look at 13.8% of the volunteers declined persevering with the remedy because of sensitivity: 9.5% from the home-use remedy and 4.3% from the in-workplace bleaching remedy.

Although teeth sensitivity is normally stated right now after the utility of the in-workplace marketers or at some point of the primary few days of the use of the home-use bleaching treatment, those activities are typically slight and resolved for the duration of or on crowning glory of the treatment. In an try to lower or restrict the aspect consequences of dental sensitivity at some stage in bleaching, producers have brought distinct desensitizing marketers into the composition of

the bleaching agent, such as potassium nitrate, sodium fluoride, or amorphous calcium phosphate. Potassium nitrate and sodium fluoride, that have been proven to efficaciously and appreciably lessen postoperative sensitivity. It is assumed that potassium nitrate reduces dental sensitivity through reducing the capping potential of nerve fibers within the dental pulp to repolarize after an preliminary depolarization because of ache sensation. Dentists have accomplished their element through the use of distinctive strategies previous to or in affiliation with the bleaching treatment, including the use of fluorides as desensitizing sellers on a tray, or prescribing those merchandise as mouth rinses or dentifrices, or topically making use of them at the outside surfaces of the teeth<sup>(7)</sup>. Fluoride can be introduced to the bleaching agent's composition as it additionally can also additionally lower sensitivity with the aid of using blocking off the dentin tubules, as a result decreasing fluid go with the drift to the pulp chamber.

Some research confirmed that using 10% CP with potassium nitrate and fluoride or using 16% CP with amorphous calcium phosphate appreciably decreased the quantity of sensitivity. Matis et al observed no variations in sensitivity whilst evaluating 15% CP containing potassium nitrate and fluoride with 16% CP containing amorphous calcium phosphate. Although the identical attention of desensitizing dealers (0.5% potassium nitrate and 0.11% sodium fluoride) have been formulated for exclusive concentrations of the home-use bleaching sellers (10% and 20% CP), a appreciably better sensitivity turned into skilled through the volunteers who used the 20% CP (71.4%) than with the aid of using folks who used the 10% CP (36.8%) the usage of the identical protocol for both. For the institution of volunteers who used the 20% CP agent, there has been a better occurrence of mild or excessive sensitivity than for folks that used the 10% CP. Thus, in evaluating the home-use merchandise, it could be counseled that a excessive attention of CP can be associated with a better incidence of teeth sensitivity.

### Conclusion

When studying the papers on the bleaching effect of different 10 carbamide peroxide tooth- decolorizing agents, it came clear that one needs to make groupings so as to be suitable to compare results. The major differences were set up in the operation period, the number of operations as well as the original selection of teeth to be paled as far as their darkness/ lightness is concerned. Likewise, in utmost cases the recommendations of the manufacturers aren't clear. For illustration, overnight or nightly could be else interpreted, from a couple of hours/ night(3.6 h) up to 11 hours/ night. The effectiveness of the bleaching treatment is one of the major factors to be considered when choosing a bleaching fashion or agent, but life, safety, and the case's convenience should also play an important part in choosing the bleaching treatment.

**Conflict of Interest:** Author declares no conflict of interests.

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