

TOOTH WHITENING MADE SIMPLE

BY PREM-PAL SEHMI

BOUTIQUE
WHITENING





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TOOTH WHITENING AND THE LAW THE EUROPEAN DIRECTIVE



The law relating to tooth whitening changed on 31 October 2012. The legislation relating to tooth whitening by the European Union draws a clear line between products that can legally be used for tooth whitening by dental professionals, and products that can be purchased by non-dental professionals.

The change follows a move in 2013 to revoke and replace the Cosmetic Products Regulations 2012, with the Cosmetic Products Enforcement Regulations 2013, commonly known as the 'EU Cosmetics Regulation.'



For each cycle of use, first use by a dental practitioner

There is a risk that a patient who has not had appropriate instruction on the use of their home kit could be at risk of swallowing excess gel. The requirement that the first use of each cycle is by a dental practitioner (or under their direct supervision) helps to prevent this.

This requirement also means that whitening products cannot be sold to patients at reception or via post.

Hygienists and Therapists

The General Dental Council's Scope of Practice sets out that hygienists and therapists can provide tooth whitening under the prescription of a dentist, if they are trained and competent.

It is advisable that the dentist is on the premises when the first use of the tooth whitening product is provided to the patient by a therapist or hygienist.

Patients Under the Age of 18

The Regulations and EU Directive specifically state the product must not be used on patients aged under 18. This can create an ethical dilemma for dentists who wish to act in the best interests of their patients but where the treatment is prohibited by the Regulations by virtue of the patient's age.

In this scenario, it is an individual clinical decision whether to breach the Regulations and provide the treatment in the best interests of the child. In order to do this, the dentist must follow the following protocol:

- Have a detailed discussion with the patient/parents, as part of the consent process.
- Ensure that patient/parents are fully informed as to the risks and benefits of both whitening procedures, and the more invasive alternatives.
- Discuss whether it is appropriate to delay treatment until the patient is 18 years of age.
- Contact indemnity provider for advice.

Breach of the Regulations

The maximum penalty for breaching the Regulations is a sentence of imprisonment not exceeding six months.

The General Dental Council's Position Statement on Tooth Whitening sets out that a registrant using products in excess of 6% may face fitness to practise proceedings and the matter will be referred to Trading Standards.



INTRODUCTION TO COLOUR

The colour of the teeth can be affected by many things, ranging from systemic factors within the body, to local factors that only affect the teeth themselves.

With time, teeth undergo significant changes which affects both shape and appearance. To fully understand the whitening process, we must first understand the properties of colour classification and light transmission through the layers of the tooth.

Understanding Colours

In order to understand how to quantify shade, we must use a colour model that can accurately describe colours. Most models work in three dimensions, and describe colour using three essential traits of hue, value and chroma.

Hue is the attribute of a colour by virtue of whether it is discernible as red, yellow, green, or blue, and which is dependent on its dominant wavelength.

In plain English, it means that hue is the main colour, or combination of colours, present. If an object looks red, the hue is red. If an object is green, the hue is a combination of yellow and blue.



With teeth, the differences in hue are pretty subtle. Chroma is the saturation or intensity of hue. Red and pink have the same hue. However, red has a high chroma while pink has weak chroma. Likewise, maroon would have a higher chroma than both red and pink.

Finally, value is the relative lightness or darkness of a colour. It is the most important factor in shade matching because the human eye is very sensitive to changes in value. On a scale of black to white, white has a high value, while black has a low value.

When light falls on an object, it is either reflected, transmitted or absorbed. If all the light is reflected, the object will appear white. If the light is absorbed, the object will appear black. In the case of teeth, reflection, transmission and absorption all occur simultaneously to varying degrees.



The Munsell Colour Solid here demonstrates the properties of colour in one simple diagram.

Hue

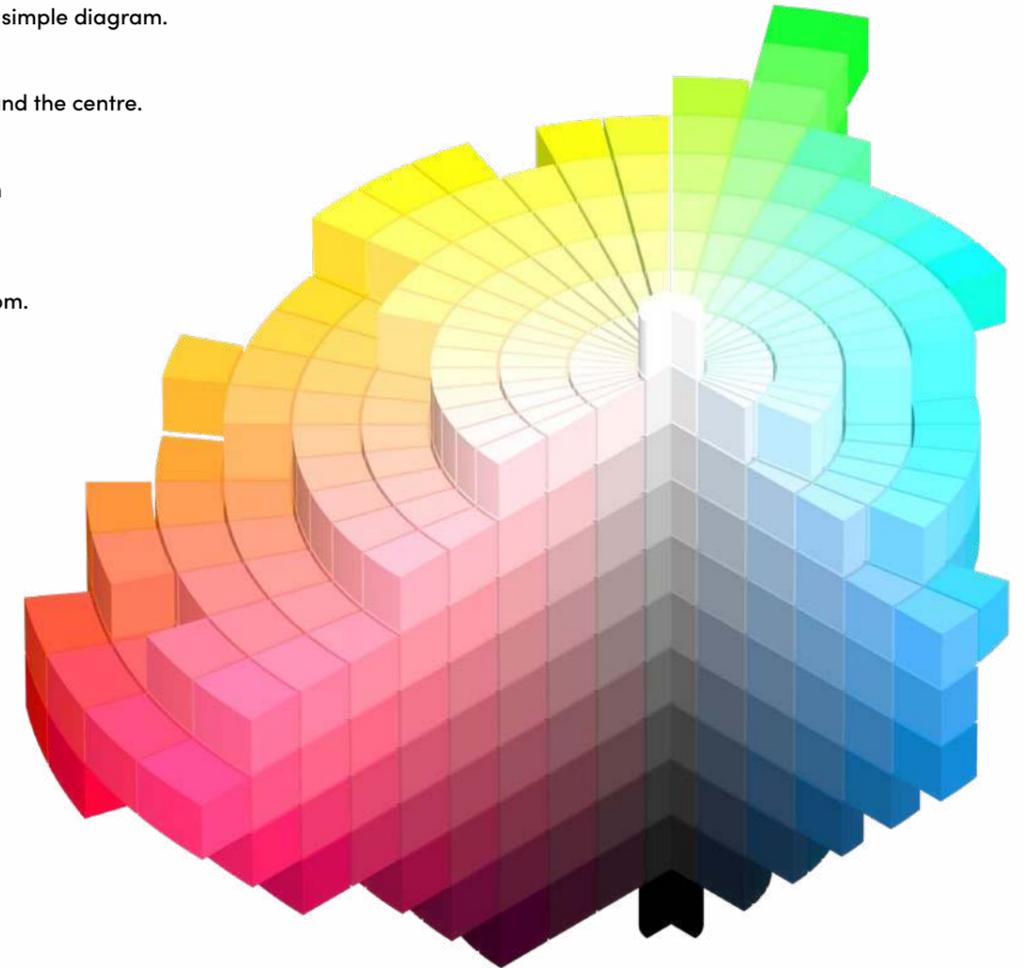
changes as you move around the centre.

Chroma

changes as you move from the centre outward.

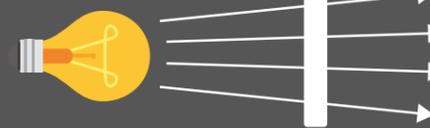
Value

changes from top-to-bottom.



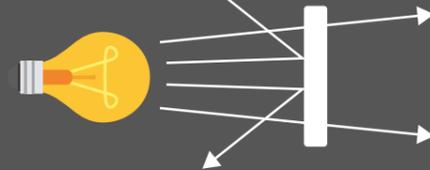
Transparent

All light passes through



Translucent

Some light passes through



Opaque

No light passes through



Transmission of light through teeth

Because teeth are made up of different layers, they have both translucent and opaque qualities. Enamel has translucent properties, in that light passes through it but is dispersed, with some being reflected.

Opacity means that light is unable to pass through at all. The dentine of a tooth is an example of an opaque medium.

When light hits an anterior tooth, the light is transmitted through the translucent enamel layer. In the incisal third, with no underlying dentine present, and where the enamel layer is thinnest, the light has less to pass through. Here the tooth appears lightest. The cemento-enamel junction of the anterior tooth is the thickest part of the tooth, with the greatest thickness of dentine. Here, the light diffuses through the enamel layer and is either absorbed or reflected by the dentin. The translucency pattern contributes to the shade by affecting value.

Over time, due to tooth-brushing and wear, the enamel layer becomes thinner. Loss of enamel thickness, increases translucency allowing the darker dentinal shade to dominate. This is an important factor when trying to anticipate whitening success in patients.

HOW TEETH DISCOLOUR

Intrinsic Staining

The success of tooth whitening depends largely on the type of staining present. Intrinsic staining is discolouration that is incorporated into a tooth, either while the tooth is developing, or after it has erupted – this stain cannot be removed by prophylaxis.

Fluorosis

Some of the main causes of intrinsic staining are excessive fluoride intake over the period that the tooth develops. The resulting fluorosis manifests itself as either white and chalky enamel, or brown staining. Either way, bleaching can be used in most cases to reduce the contrast of the mottled enamel and improve the appearance.

Antibiotics

Another major cause of intrinsic staining is use of the antibiotics, tetracycline and minocycline. These impart a blue-grey banding on the teeth. Severity of staining will differ depending on the type and duration of use. In both cases the staining is similar, however, minocycline can stain teeth both during development and after eruption. Prolonged whitening is usually required in these cases, but more often than not, it must be used in combination with bonding or veneers to get a satisfactory result.

Trauma

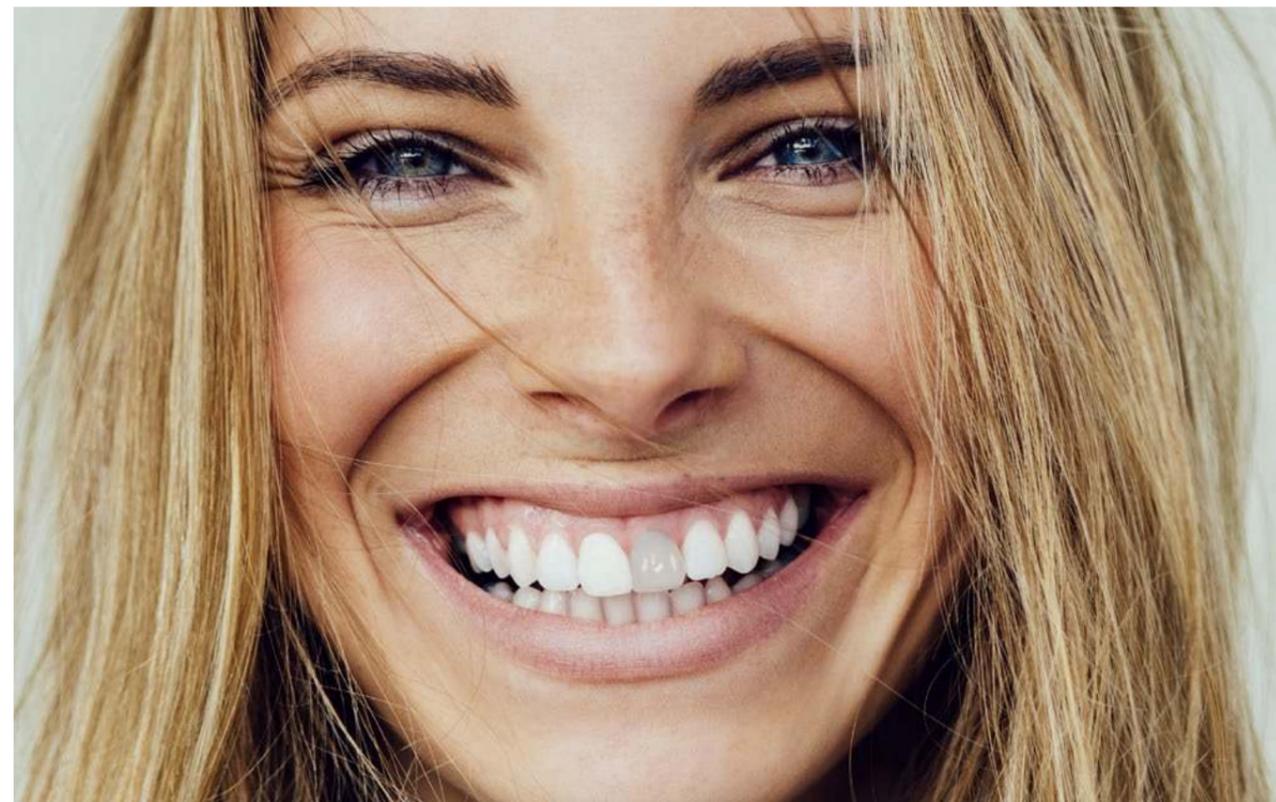
The most common cause of intrinsic staining is trauma which manifests itself in a two-fold process. Firstly, inflammation of the pulp causes hemorrhage into the dentinal tubules to give the tooth a pinkish tinge. The haemoglobin then breaks down to iron sulfide to give a dark black colour. This type of staining responds well to prolonged whitening. Likewise, if a tooth becomes necrotic secondary to trauma, a similar process occurs. However, treatment in this case must include root canal treatment to remove the necrotic material.

Family History

Other common causes of intrinsic staining are hereditary. Imperfections in the formation of either enamel or dentin can cause discoloured teeth. Both amelogenesis and dentinogenesis imperfecta, along with enamel hypoplasia are examples of hereditary causes of intrinsic staining. Diseases like porphyria can also cause discoloured teeth due to excess porphyrins in the blood during mineralization of the teeth. Affected teeth are usually pinkish brown.

Age

Age also causes intrinsic discolouration of teeth. This is due to changes in the physical composition of the tooth. Over time, layers of enamel are lost, exposing the darker underlying dentine. Sclerosis and secondary dentine can often take on a darker hue, which also contributes to age related discolouration.



Extrinsic Staining

Extrinsic staining is far more common than intrinsic staining. Extrinsic stains are those that only affect the surface of the teeth and can be removed by prophylaxis. Mostly these arise from the interaction of pigments from food and beverages with the plaque covering the enamel. This can easily be removed by dental prophylaxis and polishing. When this type of staining penetrates the microscopic cracks and fissures of the teeth, they cannot be removed by tooth-brushing or dental prophylaxis. In these instances, whitening is required.

The most common causes of extrinsic staining are coffee, tea, red wine and smoking.

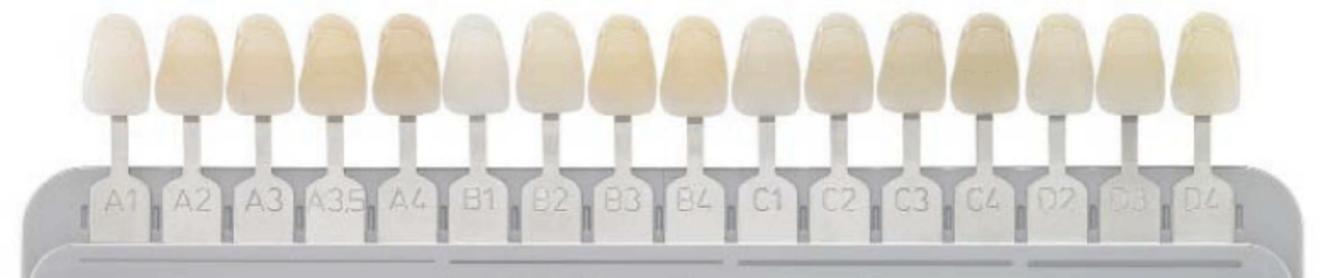


VITA SHADE GUIDE AND TOOTH WHITENING

The classic Vita shade guide is the most widely used guide for assessing tooth colour. The various letters denote the underlying hues that make up the colour for that particular group, as follows:

In terms of predicting whitening success, A shades and B shades whiten the best.

As the teeth get darker, and more grey in colour (darker C shades and D shades), more prolonged whitening is usually required.



Rather than arrange your shade guide by hue, as above, it is better to arrange it by value as shown here:



This makes more sense to patients when explaining their start and end shade. Tooth whitening will change both the hue and value of the teeth to improve the aesthetics of the smile.

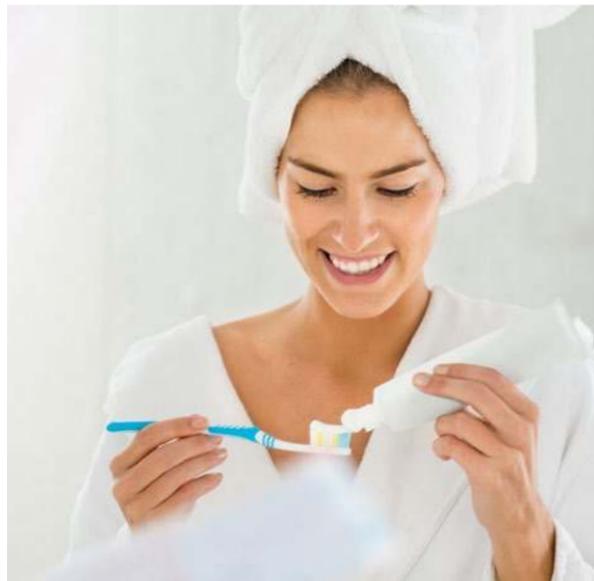


TOOTH WHITENING OPTIONS

Whitening Toothpastes

The concept of whitening toothpastes has been around for over 50 years. However, these original toothpastes were excessively abrasive and worked by removing stain and enamel layers. Modern versions of whitening toothpastes are much more tooth friendly and, if used regularly, can help to maintain whiter teeth. The key word here is MAINTAIN – they rarely whiten to any great degree.

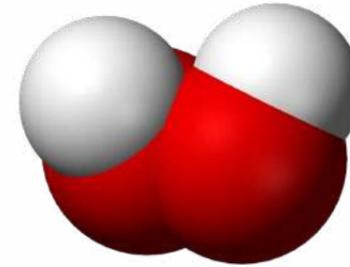
Whitening toothpastes contain detergents and a very mild abrasive to gently scrub staining from the surface of the enamel. Silica is the most commonly used abrasive, although some products also contain alumina and dicalcium phosphate. Additional chemical or polishing agents such as peroxide, titanium dioxide and baking soda are also used. In the concentrations used, none of these products actually alter the shade of the tooth itself.



Whitening Provided by Dental Professionals

Hydrogen Peroxide vs Carbamide Peroxide

The active ingredient in Boutique Whitening products is hydrogen peroxide. Some of our products contain carbamide peroxide, which breaks down to hydrogen peroxide.



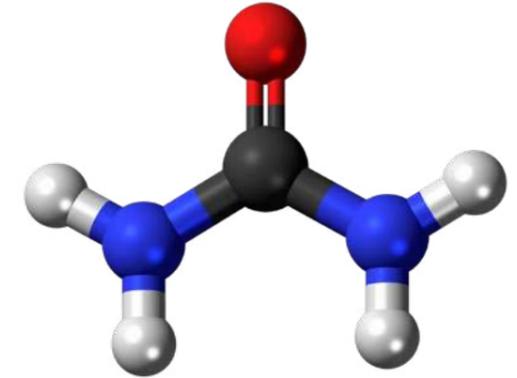
The chemical formula for hydrogen peroxide is H_2O_2 .

A man named Louis Jacques Thenard discovered it in 1818. Hydrogen peroxide is a potent oxidizing agent. The whitening action is a result of oxygen free radicals that oxidize larger pigment molecules into smaller, less visible molecules.

By the European Directive dental professionals are only permitted to sell products that contain a maximum of 6% hydrogen peroxide.

Over-the-counter products that do not require the supervision of a dental professional may contain only 0.01% hydrogen peroxide. These products are ineffective in whitening the teeth as the concentration of peroxide is too low.

Carbamide peroxide is hydrogen peroxide compounded with urea. Urea helps stabilise the formula giving carbamide peroxide a more predictable and longer shelf life than hydrogen peroxide alone.



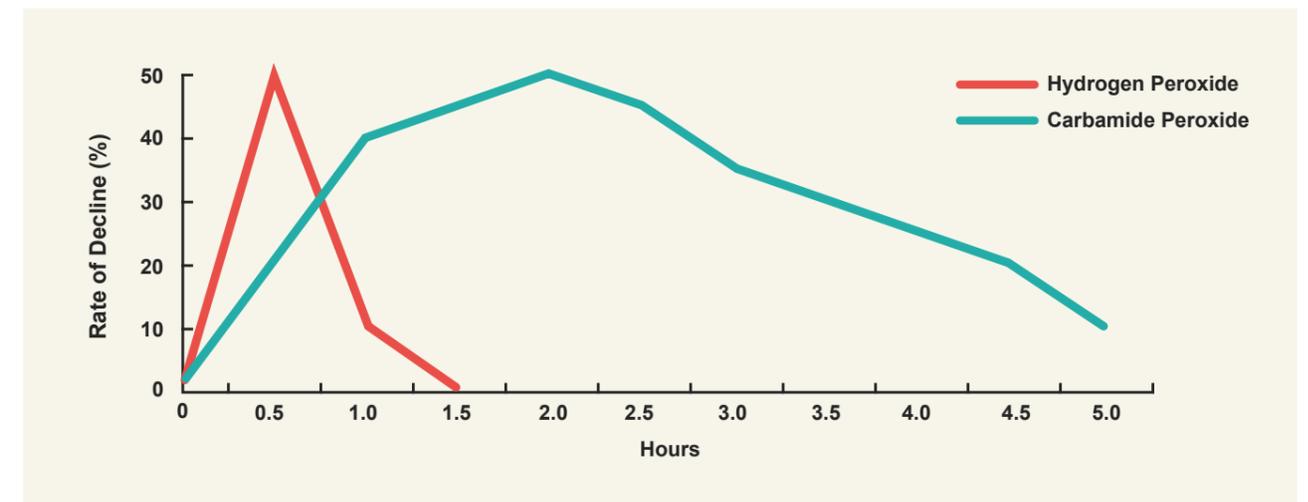
The chemical formula for is $CH_6N_2O_3$.

By the European Directive, dental professionals can prescribe up to 16% carbamide peroxide.

In the presence of water, carbamide peroxide degrades into urea and hydrogen peroxide. Any given volume of carbamide peroxide will yield 35% volume of hydrogen peroxide when it breaks down.

A notable difference between hydrogen peroxide and carbamide peroxide is the rate of breakdown, and therefore, the rate of release of oxygen ions. Carbamide peroxide is a more stable molecule and breaks down more slowly than hydrogen peroxide. Carbamide releases about 50% of its peroxide in the first 2 to 4 hours, then the remainder over the next 2 to 6 hours.

Hydrogen peroxide breaks down almost immediately, releasing its peroxides entirely within the first hour. It is thought that due to this relatively concentrated bombardment of peroxides on the pulp, hydrogen peroxide produces more sensitivity than carbamide peroxide of a comparable concentration.



In Office Tooth Whitening

Whitening lamps or 'laser' tooth whitening options are often perceived by the public to be superior to home whitening because they can 'see' the procedure being performed.

Is the light necessary and is there any clinical benefit?

This raises some controversy and polarises opinion.

The theory is that the light 'activates' the gel in some way, increasing the rate of free radical release. There are numerous studies showing the lights to be effective, however, these are usually done by the companies that manufacture the lights themselves. These should therefore be approached with an open mind!

So although there is questionable evidence to prove the effectiveness of lamps, if your patients are happy with the results, and they enjoy the experience then the choice is up to you.

There is however, an over whelming body of evidence to show that dentist supervised home whitening is very effective, and produces consistently superior results.

Internal Whitening

Teeth can darken for a variety of reasons, one of the most common being external trauma.



When a tooth experiences trauma, the pulp becomes necrotic. Blood is released as a result of the subsequent inflammation. When the hemoglobin breaks down to iron sulfide, it stains the dentinal tubules black. Non-vital teeth often respond relatively well to external bleaching techniques, however, it is necessary in some cases to whiten the tooth from within the root canal system.

The full protocol is described here:

- 1 Internal bleaching is possible only after a root canal has been performed.
- 2 The pulp chamber must be cleaned with ultrasonic tips to remove all necrotic tissue, pulp and blood.
- 3 The gutta-percha is removed from the coronal portion of the pulp chamber to just beneath the level of the cemento-enamel junction. This should only be done after the endodontic cement has had a chance to fully set. It is advisable to use non-eugenol based endodontic cements as these inhibit the bonding of composite resins.
- 4 Resin-modified glass-ionomer should be used to seal the canal. Studies have shown that internal resorption can occur if bleaching products seep into the root canal space.
- 5 10% Boutique by Night (Carbamide Peroxide) should be introduced into the pulp chamber via syringe, and changed every 2 hours.
- 6 Alternatively, you can use a 16% carbamide peroxide and the same protocol as described above.
- 7 In more extreme cases, you can use the inside/outside technique whereby the above protocol is followed, but supplemented with a single tooth whitening tray, with gel placed buccally and palatally, throughout the process and overnight.
- 8 Most cases will resolve in 2 to 4 days, and you can continue to whiten as normal.



Supervised Home Whitening

Dentist-supervised home-whitening is the safest, most popular, and most well-researched whitening procedure.

As with all dental procedures, the first step is a thorough assessment and diagnosis, coupled with good quality photographs showing the closest matching shade tab (always ensure you can see the label of the shade tab).

Laboratory made trays versus in-house trays

This technique requires the manufacture of custom fabricated trays by a laboratory skilled in the use of thermoplastic materials – they should NEVER be manufactured by the dentist in house. The time taken to manufacture trays in-house negates any cost saving, and the lack of quality will adversely affect the outcome of the treatment.

The ideal work-flow to manufacture the trays is outlined below. This would be difficult to recreate when manufacturing the trays in-house, hence our recommendation to always have laboratory made trays.



Trays should ideally be made with a 1.5mm single-skin, semi-rigid material.

Vacuum and pressure forming together will ensure a tray that is a close fit to the model. Vacuum forming alone usually results in a poor fitting tray.

The gingival margins should be carved prior to forming. This creates a marginal seal to prevent ingress of saliva, and wash-out of the gel.

There are two schools of thought as to how the margins of the tray should be finished – scalloped or straight. Boutique trays come with a straight margin. This requires less finishing which results in a closer fitting, more stable tray. If a whitening tray has reservoirs then a scalloped margin is better to ensure excess gel can be removed easily.

The literature shows that reservoirs are not required. Boutique trays are manufactured with no reservoir, however, they do have a 'dosing dot, basically a small dimple on the labial surface of each tooth. The patient simply has to fill the dot to ensure the correct volume of gel is dispensed. This means less problems with sensitivity due to over filled trays and gel touching the gingivae. The kits also last longer, which in turn gives better results.

BOUTIQUE - HOW DOES IT WORK?

There are several protocols for Boutique Whitening depending on the needs and wants of individuals. The initial clinical process is always the same regardless of the whitening protocol selected.

<p>1 Full examination.</p>	
<p>2 Photographs with time stamp and shade tab.</p>	
<p>3 Restore any exposed root dentine with composite or glass ionomer.</p>	
<p>4 Use one of these chair-side desensitisers on any sensitive areas, as directed in the instructions.</p>	
<p>5 Use Sensodyne Toothpaste in the whitening trays overnight for 3 nights prior to whitening.</p>	
<p>6 Brush with Boutique Biomin Toothpaste for 2 weeks prior, and throughout, the whitening process.</p>	
<p>7 Select the correct gel by speaking with your patient to see what is best suited to their lifestyle.</p>	
<p>8 Before placing the trays, make sure your teeth are completely dry.</p>	

BOUTIQUE BIOMIN TOOTHPASTE

Boutique Biomin Toothpaste

Boutique Biomin Toothpaste should be used 2 weeks prior to whitening, and throughout the whitening process. It can be used after the whitening is completed to help maintain white teeth and reduce the symptoms of sensitivity.

Boutique Biomin Formula

Boutique Biomin formula contains a new generation of bioactive glass, incorporating fluoride, phosphate and calcium ions which are released gradually over 12 hours. As it dissolves, the glass structure precipitates as fluorapatite which aids remineralisation of tooth enamel.

Fluorapatite is more stable and resistant to acidic attack than hydroxyapatite formed by previous generation bioactive glass.

Biomin particles chemically bond to calcium in the enamel, and as they dissolve the ions occlude exposed dentinal tubules which prevents hydraulic conductance, and reduces sensitivity.

Biomin is engineered for 'smart activation' in acidic environments, such as following consumption of certain food and drink. Low pH causes the bioactive glass to dissolve more rapidly, neutralising the acid, restoring pH balance and replacing lost minerals.

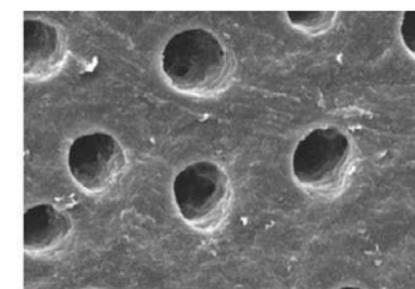


Figure 1a: Biomin F – tubule occlusion. Before brushing

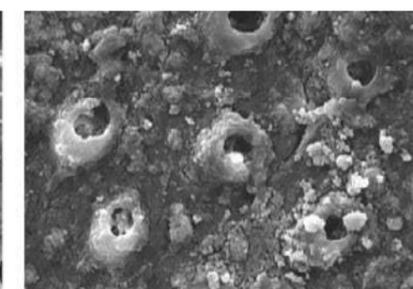


Figure 1b: Biomin F – tubule occlusion. After brushing with Biomin F

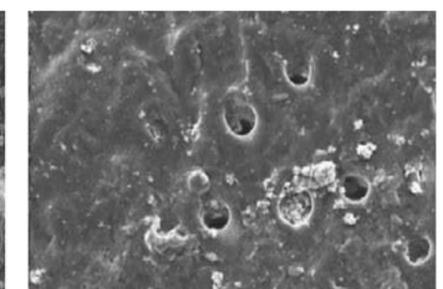


Figure 1c: Biomin F – tubule occlusion. After acid challenge. The tubules remain occluded

OUR WHITENING GELS

BOUTIQUE BY DAY

6% HYDROGEN PEROXIDE

- This gel is designed for 1.5 hours wear per day.
- Standard kit is 4 x 3ml syringes and should last around 3 weeks.

BOUTIQUE BY NIGHT

10% CARBAMIDE PEROXIDE

- This gel is designed for 4-6 hours wear per day.
- Standard kit is 4 x 3ml syringes and should last around 3 weeks.
- This kit is for patients who have sensitive teeth.

BOUTIQUE BY NIGHT

16% CARBAMIDE PEROXIDE

- This gel is designed for 4-6 hours wear overnight.
- Standard kit is 4 x 3ml syringes and should last around 3 weeks.



BOUTIQUE B1 GUARANTEE

16% CARBAMIDE PEROXIDE

- This gel is designed for 4-6 hours wear per day.
- B1 kit is 8 x 3ml syringes and should last around 6 weeks.
- Our Boutique trays must be used to claim the guarantee and you must follow the B1 protocol (downloadable from our website)

BOUTIQUE HYBRID PRO

4.25% HYDROGEN PEROXIDE 4.25% CARBAMIDE PEROXIDE

- This gel is designed for 3-4 hours wear overnight.
- Pro kit is 4 x 3ml syringes and should last around 3 weeks.
- This kit provides a double action formula which delivers an instant hit of whitening via the peroxide, and a prolonged whitening effect from the carbamide.



SELECTIVELY WHITENING CANINE TEETH

You may have noticed, even after whitening, that some of your teeth are darker than others? For most people, the canines on the top teeth, and the 4 middle incisors on the bottom, can often be more yellow than the other teeth. Why does this happen?

The canine teeth have very thick dentine and thinner enamel which gives them a yellower look than the surrounding teeth. The lower incisors are small teeth with a very thin enamel layer, which again, gives them a yellow colour.

Some patients need selective whitening of their canine teeth after completing full whitening treatment. Dentine takes longer to whiten than enamel. If a patient presents with canines and lower incisors which are still yellow, or yellow around the necks of the teeth, these need further whitening which will usually elevate the colour to same as the rest of the mouth.

THE EFFECT OF WHITENING GEL ON ENAMEL, DENTINE & PULP

Tooth whitening is one of the most researched cosmetic procedures in the world and has a wealth of evidence to support the effectiveness and safety of the take home technique, if correct protocols are observed.

There are many studies that exist which demonstrate the effects of peroxide on the various layers of the human tooth.

Enamel

Enamel is not significantly affected by the use of peroxide based products. A study by Leonard, et al, in 2001 assessed the effect of 10% carbamide peroxide on the surface morphology of enamel after 2 weeks, and again after 6 months, using electron microscopy at 2000 times magnification. There was no significant effect on the surface of enamel immediately after whitening and it did not worsen over time.

Dentine

Dentine is affected more by the whitening process than enamel tissue. Spyrides GM, et al, study from 2000 showed that dentine bond strength decreased by as much as 76% post whitening.

Further research from Na-Young Jeong, et al, in 2006 showed that 2 weeks was sufficient to allow the dentine to recover and bond strengths returned to near the same as pre-whitening levels.

Always schedule any restorative work at least 2 weeks after the patient has finished whitening.

If there is any immediate bonding required, soaking the dentine in a 70% ethanol solution for 2 minutes can restore bond strengths to near pre-whitening levels.

Pulp

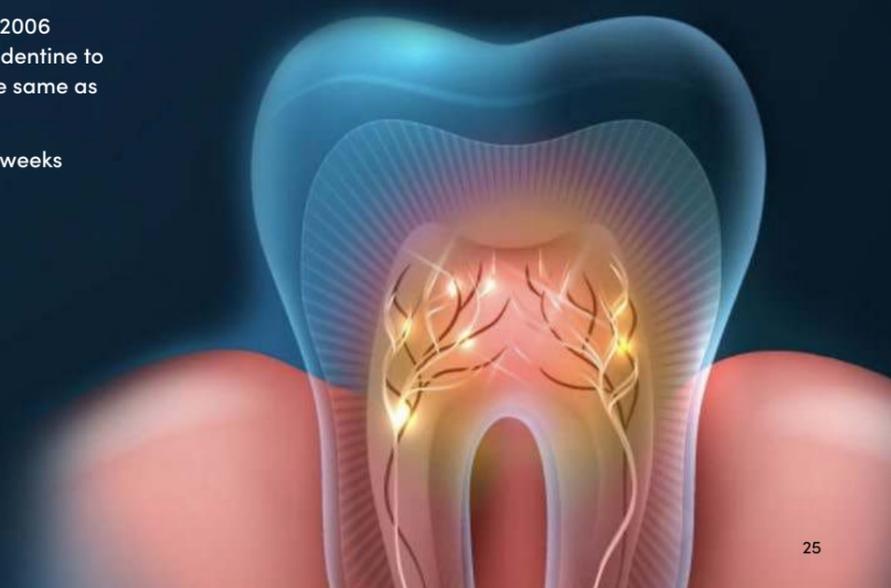
Due to the sensitivity associated with tooth whitening, it is often wrongly assumed that whitening causes pulpal damage.

JO Fugaro, et al, did a study in 2004 on the reaction of pulpal tissue to two weeks use of 10% carbamide peroxide.

The findings from this study demonstrated that 10% carbamide peroxide can cause mild, localized pulp reactions, however, these did not affect the overall health of the pulp tissue and were reversible within two weeks post-treatment. Therefore, two weeks of treatment with 10% carbamide peroxide is considered safe for the pulp.

Another study by Cohen showed that hydrogen peroxide up to 35% concentration was harmless to the pulp.

It is a safe assumption that no long term harm will come to the pulp from the concentrations of whitening solution that are used in home whitening.



POSSIBLE ISSUES AND SIDE EFFECTS

Tooth whitening is a very safe procedure when performed correctly. However, there are some potential side effects that you must inform the patient about prior to the procedure.

It is also important to have the knowledge to circumvent these issues to help patients achieve a fantastic result.

Protocol for Extreme Sensitivity

The most common side effect of any whitening procedure is sensitivity. This problem affects, to varying degrees, up to 75% of whitening patients. Sensitivity is a major issue if the patient cannot continue with the whitening.



The protocol for treating patients with extreme sensitivity is as follows:

- 1 Full examination.
- 2 Photographs with time stamp and shade tab.
- 3 Restore any exposed root dentine with composite or glass ionomer.
- 4 Use a chair-side desensitising agent on any areas of sensitivity, as directed in instructions.
- 5 Use Sensodyne Toothpaste in your whitening trays, overnight, for 3 nights.
- 6 Use Boutique Biomin Toothpaste for 2 weeks prior to, and throughout the whitening process.
- 7 Switch to using 10% Carbamide Peroxide - Boutique by Night.
- 8 If sensitivity is severe, use the ramp technique. Start the patient on 6% Carbamide Peroxide with only 1 or 2 hours wear time, gradually increasing the wear time so that after 2 weeks the patient can manage to wear the trays overnight. After 2 weeks switch to 10% Carbamide Peroxide.
- 9 If the sensitivity persists, then instruct the patient to whiten on alternate nights, and wear the Sensodyne Toothpaste in the trays overnight on the days in between.

Gingival Irritation

Another potential side effect of the whitening process is gingival irritation. This occurs when the whitening gel has prolonged contact with the gingival tissue.

This can be avoided by educating the patient that they need only fill the dosing dots on the tray and no more, this will avoid an excess of gel and the subsequent gingival irritation. If they do get an excess of gel then this should be removed with a clean tissue or soft toothbrush.

The best way to limit most problems is to ensure that the trays are well made by a laboratory. The quality and precision required is impossible to recreate in surgery made trays. Isolation of the bleaching product from the rest of the mouth will successfully limit most problems. Likewise, patient education on how to properly fill the trays will also help.

Disappointing Results

This is a classic example of making sure that you under promise, and over deliver, in your initial talks with the patient, and the treatment that follows.

Tooth whitening is not an exact science, and 1 pack of whitening does not always equal the perfect result for your patient. It may take more. This should always be made clear from the outset.

We know from the Van Haywood studies that hydrogen peroxide will whiten the teeth in almost all cases. If the teeth do not whiten, the answer is to extend the treatment time. This approach will rarely fail.

Bruxists and Tooth Whitening

If you are attempting overnight whitening on a patient with nocturnal bruxism, the results will likely be poor.

As the patient clenches and grinds, the flexing of the trays will cause saliva ingress and washout of the whitening gel.

In these patients, the best option is to use Boutique by Day gel.



CONTRADICTIONS FOR WHITENING

- Teeth which seem at an acceptable shade, which is subjective for clinician and patient.
- Presence of composite restorations, mixed with natural tooth structure, which will not lighten with treatment. They may need replacing post whitening.
- Porcelain restorations such as crowns and veneers will not lighten, and may require replacement after whitening treatment.
- Pregnant or lactating women.
- Patients who are unable to be compliant.
- Patients with unrealistic expectations.
- Patients with exposed cementum and exposed root surfaces. Cementum does not lighten.



BEFORE & AFTER CASES



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