Stain removal and low abrasion toothpastes that do what they say on the tin!

The variety of toothpastes available means that many patients choose a brand based on how effective it is at targeting some of the most common dental problems such as staining, bad breath, sensitivity, and gum disease. They probably do not even give a second thought to the ingredients and the effect they may be having on their teeth and overall oral health.

Many may be under the false impression that removing stains caused by drinking tea, coffee, red wine or tobacco, and regain a bright, white smile, they need to resort to costly teeth whitening treatment, harsh acids and abrasives, or home bleaching kits. This isn’t the case.

Ingredients for effective stain removal

With stain removal toothpastes now firmly established on the market, it’s important that patients are aware of the effective toothpastes available, which are clinically proven to work. Such toothpastes contain ingredients that can remove surface stains as part of your patient’s daily, oral health care regimes, to brighten, lighten and whiten teeth, such as:

- Hydrated Silica, which is a low abrasive powder ingredient, frequently combined with the softer Carbonate, to provide a smooth gel-like quality that works hard to remove plaque and stains and whitens the teeth. It provides brightening without taste or odour, and may also be labeled as amorphous silicon dioxide, silicic acid, or silica gel. This mild abrasive is harmless and is even listed by the US Food and Drug Administration as “Generally Recognized as Safe”.
- The stain-dissolving agent, Pentasodium Triphosphate, which prevents food particles sticking to the teeth, effectively keeping teeth whiter for longer.

- For extra stain removal, the anti-tartar ingredient, Tetrasodium Pyrophosphate coats the surface of teeth to prevent bacteria forming, leaving your teeth feeling and appearing brighter all day.

Whiten, quickly and effectively

A UK Dental School performed an in-vitro laboratory study, which aimed to measure stain removal and discover how effective various toothpastes were at removing dietary stains from Perspex, compared to water.

The assessment involved obtaining stimulated saliva from two volunteers, who had not eaten or drunk anything, other than water, for two hours. Approximately 100ml was used for the 10 staining cycles (10/15ml per cycle). All Perspex samples were immersed in human saliva for two minutes; 2ml of 0.2% Chlorhexidine mouthwash for two minutes; and 1ml tea solution for 60 minutes, before being removed and rinsed in distilled water.

Toothpaste slurries were prepared by mixing a ratio of 3g toothpaste:10ml distilled water for each cycle. Fresh saliva proceeded to be collected from a single source, and the tea and Chlorhexidine solutions changed after each staining cycle. Perspex blocks were measured before and after immersion in toothpaste slurries, for periods of between one and five minutes, and the stain removal percent calculated.

The laboratory tests revealed that stain removal was performed after just one minute. Of the products tested, Beverly Hills Formula Natural Whitening Expert (see Fig. 1) proved most effective at removing stains when compared with other leading brands of whitening toothpastes and toothpolishes, with over 91% of stains removed over a five-minute period.

Other products within the range also scored exceptionally well with Beverly Hills Formula Perfect White (coded as “PLMO/1x1158 Stain Removal” in the study) removing nearly 91% of stains and Beverly Hills Formula Dentists’ Choice Gum & Whitening Expert toothpaste removing over 88%. Meanwhile, other leading brands of whitening toothpastes and toothpolishes scored as low as 41%, a remarkably low percentage, considering water alone removes 48% of staining.

Abrasions Levels – How Low Can You Go?

All toothpastes contain abrasives; they provide the cleansing power needed to keep teeth clean and help prevent gum disease by removing plaque, stains and debris. However, in the search for the right toothpaste, it’s important to find one that does “all of the above” but is not so harsh that the abrasives attack the enamel.

The development of toothpaste and its abrasive technology goes back as far as the Egyptians in 4th Century AD and the Romans, when the most effective recipes included crushed flowers, bones and oyster shells. Today, abrasive ingredients include particles of aluminium hydroxide (Al(OH)3), calcium carbonate (CaCO3), various calcium hydrophosphates, silicas and zeolites, and hydroxyapatite (Ca5(PO4)3OH), and can account for up to 60% of some brands of toothpaste.

Patients should steer clear of highly abrasive toothpastes as they can damage the teeth and gums. As tooth enamel is worn away, the dentin beneath is more visible and teeth become more yellow in appearance. They can also remove the luster and polish of porcelain veneers and crowns, dulling an otherwise beautiful smile. Abrasive toothpastes can also cause teeth to become sensitive and in the most severe of cases can result in infection and even tooth loss.

Abrasions Testing

The abrasiveness of toothpaste is measured according to the RDA (relative dentin abra- sivity) value, and any value over 100 is considered to be “abrasive”. Unfortunately the RDA Value is often not included in the marketing or promotional information supplied with toothpaste products, masking what is a common problem.

In July 2012, a USA-based independent testing laboratory tested the abrasion levels of 15 toothpastes. The results confirmed that Beverly Hills Formula’s whitening toothpaste is less abrasive than other leading brands of both whitening and regular toothpastes. In fact, Beverly Hills Formula Total Breath Whitening scored as low as 90 on the Abrasivity Index Table, whilst some leading competitors have values as high as 138. Beverly Hills Formula Perfect White scored 95; and Beverly Hills Natural Whitening Expert, 99 (see Fig. 2). These results signal a breakthrough in oral care and aesthetics, removing stains no longer requires harsh abrasives or bleach, as this new generation of whitening toothpastes offer a more tooth-friendly solution, helping patients to preserve their teeth to a natural white colour, quickly, safely and effectively.

Complete tooth protection

Choosing the right toothpaste is important in the fight to ensure a healthy mouth and using the wrong type of toothpaste can lead to serious oral health issues. For peace of mind, the Beverly Hills Formula whitening range also contains fluoride to offer fast-acting, long-lasting protection against acid attack, whilst helping to strengthen, re-mineralise and harden enamel for complete tooth protection.

In today’s image conscious society, the power of a gleaming smile can never be under- estimated, and it needn’t be at a huge expense. So why not recommend a toothpaste which delivers professional whitening results and leaves teeth feeling and appearing brighter all day?

For more information, please call +353 1842 6611; email info@beverlyhillsformula.com; or visit www.beverlyhillsformula.com.

Follow us on Twitter: @BHF_Whitening

Contact Information

Eric Peterson, Founder of whitening toothpaste Beverly Hills Formula, has over 20 years experience within the oral health and beauty sector. With a primary focus on delivering fast, yet safe, teeth whitening results, Eric has successfully introduced many innovative whitening toothpastes to the market.

Fig. 1. Stain Removal Study Results (UK leading Dental School, 2012)

Fig. 2. Certificate of Analysis: Toothpaste Abrasiveness (USA, 2012)

DENTAL TRIBUNE Middle East & Africa Edition | Jan-Feb 2013
The effectiveness of toothbrushing

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Plaque control is the cornerstone of the prevention and control of periodontal disease and caries. However, though salivary flow has some limited potential in cleaning debris from interproximal spaces and occlusal pits, it is less effective in removing and/or washing out plaque, and natural cleaning of the dentition by physiological forces—that is movement of the tongue and cheeks—is virtually non-existent. [1]

Therefore, to be controlled, plaque must be removed frequently by active methods, and evidence from large cohort studies has demonstrated that high standards of oral hygiene will ensure effective plaque removal. [2] There is substantial evidence that toothbrushing can control plaque, provided that cleaning is sufficiently thorough and performed at appropriate intervals. The underlying factors that influence the effectiveness of toothbrushing include toothbrush design, its action, ease of use and patient compliance.

Systematic reviews

Evidence-based dentistry is an approach to oral health care that requires judicious integration of systematic assessment of clinically relevant scientific evidence with the dental professional’s clinical expertise, the patient’s treatment needs and preferences and the available resources. Systematic reviews are considered to provide the highest level of evidence and to be the primary tool for summarising the existing evidence in a reproducible and systematic way. As such, they are crucial for evidence-based decision-making. Systematic reviews differ from traditional reviews in that they are usually confined to a single focused question that serves as the basis for systematic searches, selection and clinical evaluation of the relevant research. Systematic reviews minimise bias and provide a comprehensive and contemporary overview. Such analyses are objective in their appraisal of quality and transparent in their assessment of heterogeneity, allowing others to appraise the methodology and quality of the review itself. By performing a meta-analysis on sufficiently similar studies, a pooled estimate of the common mean can be calculated, the range of outcomes limited and the strength of the results increased. The Cochrane Handbook for Systematic Reviews of Interventions [3] declares that reviews are needed to help ensure that healthcare decisions can be based on informed, high-quality, timely research evidence. In addition, the American Dental Association has launched the Center for Evidence-Based Dentistry website, which currently contains over 1,600 clinically relevant systematic reviews.

PICO(S) rule

The protocol for a systematic review is developed beginning with a carefully formulated question using the PICO(S) rule—patient, intervention, comparison, outcome parameters and study design. The manner in which this question is formulated is decisive for interpretation of the results of the review. After the research protocol has been written, an objective literature search is undertaken to find the relevant literature, while minimising the possibility of overlooking any research. The parameters used to evaluate the results are also important for the conclusions that will be drawn. An example of the parameters used is the reduction in plaque and gingivitis associated with the use of different types of toothbrushes.

Toothbrushing

The use of mechanical devices for the routine cleaning of teeth dates back to the ancient Egyptians, who made a brush by chewing on the end of a twig to fray it. Today, there are literally hundreds of manual toothbrush designs, including bristle patterns that are designed to enhance plaque removal in hard-to-reach areas of the dentition, particularly proximal areas. Much emphasis has also been placed on new ergonomic designs, for example handle sizes adapted to the hand size of the prospective user. Nevertheless, even adults, despite their apparent efforts, appear not to be as effective in their plaque removal as might be expected.

The effectiveness of manual toothbrushes in a systematic review

Brushing-exercise studies, commonly used for toothbrush evaluations, serve as a useful indication of the ability of a toothbrush to remove plaque and facilitate the control of confounding variables such as compliance. A recent systematic review evaluated the efficacy of manual toothbrushing with respect to toothbrush design and brushing duration following such exercises. [4] In this review, a literature search yielded 2,079 titles and abstracts, of which 59 studies, with 212 brushing exercises as separate legs of the experiments and with 10,806 participants, met the eligibility criteria for inclusion. The mean pre- and post-brushing plaque scores found in the studies were used to calculate an overall weighted mean reduction in plaque score (42 per cent). The shear magnitude of the number of participants and the heterogeneity observed in the various study designs give the results particular value, as they reflect what may be generally expected from routine oral hygiene. In the studies with data assessed according to the Quigley–Hein plaque index, [5] the weighted mean reduction in plaque score was 30 per cent (95 per cent CI 27 to 33 per cent), while in the studies using the Navy plaque index a weighted mean reduction in plaque score of 53 per cent (95 per cent CI 50 to 56 per cent) was observed. Sub-analysis of the different bristle tuft configurations illustrated variation in ability to remove plaque (24 to 61 per cent), with the angled bristle design demonstrating the highest overall weighted mean reduction in plaque score with either index. A sub-analysis of the influence of the duration of brushing revealed an overall weighted mean reduction in plaque score of 27 per cent after one minute of brushing and 41 per cent after two minutes. Therefore, it was concluded that the efficacy of plaque removal resulted in an overall weighted mean reduction in plaque score from baseline of 42 per cent, with a range of 30 to 53 per cent depending on the plaque index used. The available evidence indicates that bristle tuft arrangement (flat-trim, multi-level, angled) and brushing duration are variables relevant to efficacy. Irrespective of the index used, it appears that there is room for improvement regarding the efficacy of manual toothbrushes.

Powered (electric) toothbrushes

The first successful powered toothbrush (the Broxodent) was conceived in Switzerland in 1954 by Philippe-Guy Woog, and the first generation of powered toothbrushes had a brush head like that of a manual toothbrush and designed to have a (combined) horizontal and vertical action. Since the 1980s, tremendous advances have been made and various powered toothbrushes have been developed to improve the efficiency of plaque removal. Powered toothbrushes currently available vary in their action. Oscillating-rotating toothbrushes are designed with a round head that moves back and forth, with alternating twists clockwise and counter-clockwise. In contrast, toothbrushes with a circular action rotate in one direction only, counter-oscillating toothbrushes have tufts of bristles that rotate back and forth independent of the directions of other tufts, and other toothbrushes move from side to side (including sonic toothbrushes). At different times, individual studies have been conducted on the efficacy and safety of these powered toothbrushes categories and the collective evidence has been summarised in systematic reviews.

Powered versus manual toothbrushes

An early dental systematic review, performed in collaboration with the Cochrane Oral Health Group, compared powered...
and manual toothbrushes in everyday use, principally in relation to plaque removal and gingival health. [6] In this review, five electronic databases were searched to identify randomised controlled trials that compared powered and manual toothbrushes (up to the middle of 2012) in which the participants were members of the public with uncompromised manual dexterity who brushed unsupervised for at least four weeks. The review was first updated by Robinson et al. (2005) and the most recent update of this review was published by Yacoob et al. (2011). [7,8] In total, 50 eligible trials involving 4,326 participants, with no evidence of publication bias, were included in the review.

Oscillating-rotating powered toothbrushes resulted in greater plaque and gingivitis reduction compared with manual toothbrushes, with standard mean differences (SMD) for plaque and gingivitis reduction of 0.33 (95 per cent CI: -0.74 to 0.31) and 0.49 (95 per cent CI: -0.73 to 0.26), respectively, in the short term (one to three months). Significantly greater plaque and gingivitis reduction was also found in the long term (i.e. beyond three months), with approximately 27 per cent fewer sites with bleeding on probing.

The conclusion of this last systematic review was that only for oscillating-rotating toothbrushes is there consistent evidence of their clinical superiority to manual toothbrushes and greater ability to reduce plaque and gingivitis. These results confirm the findings and conclusions of the earlier reviews that compared powered and manual toothbrushes.

Comparison of different powered toothbrushes

The most recent Cochrane review assessed the comparative efficacy of powered toothbrushes with differing action and their effect on oral health. [9] Five electronic databases were searched for studies conducted up to July 2010, resulting in a total of 17 eligible trials, with more than 1,300 total participants. The criteria for selection were that the studies were randomised, compared at least two powered toothbrushes with differing action and involved at least four weeks of unsupervised brushing, and that their participants had uncompromised manual dexterity. The action of the toothbrushes in these trials was oscillating-rotating, counter-oscillating, side-to-side, circular, ultrasonic, multidimensional and ionic (electrically active).

Based on seven trials of up to three months in duration, with no significant heterogeneity, oscillating-rotating toothbrushes were found to result in statistically significantly greater plaque reduction in the short term (one to three months) compared with side-to-side powered toothbrushes. The SMD for plaque reduction was calculated as 0.24 (95 per cent CI: 0.02 to 0.46). Clinically, the relative efficacy of the oscillating-rotating action to the side-to-side action equated to a 7 per cent reduction in the Turesky modified Quigley-Hein plaque score. The SMD for short-term gingivitis reduction of 0.35 (95 per cent CI: -0.04 to 0.74) was not statistically significant. As only one trial of more than three months in duration was available, and with only a limited number of participants, no firm long-term conclusions could be drawn.

The safety of powered toothbrushes

A systematic review was recently conducted on the safety of oscillating-rotating toothbrushes compared with manual toothbrushes regarding hard and soft tissue. [10] After searching several electronic databases, 35 original papers were selected for inclusion and grouped by research design (randomised controlled trials with safety as the primary outcome, trials in which safety was a secondary outcome, studies that used a surrogate marker of safety, and laboratory-based studies).

The review authors concluded that “this systematic review of a large body of published research in the preceding two decades consistently showed oscillating-rotating toothbrushes to be safe when compared with manual toothbrushes, and collectively indicated that they do not pose a clinically relevant concern to either hard or soft tissues”. The outcome is consistent with the observations of the Robinson et al. (2005) and Yacoob et al. (2011) reviews, supporting the safety of oscillating-rotating powered toothbrushes. [7,8] There are at present no systematic reviews on safety for any other powered toothbrush.

Other considerations

Evidence-based dentistry is important for decision-making; however, it has to be noted that clinical outcome may not be the only decisive factor. For instance, while a powered toothbrush may offer ease of use and improve patient compliance with brushing, the increased cost of powered toothbrushes may affect a patient’s toothbrush choice. It is the manner in which the user brushes that determines the efficacy of plaque removal. The role of the dental professional is to coach and motivate the patient. Features such as a timer and visual signals on a toothbrush help to increase engagement of the user while brushing, and have been found to result in improved brushing and patient compliance.

Conclusions

Based on the available evidence, oscillating-rotating toothbrushes have been shown to result in greater plaque and gingivitis reduction compared with manual toothbrushes. Additionally, based on short-term data, oscillating-rotating toothbrushes compare favourably to powered toothbrushes with a side-to-side action, while insufficient evidence is available for other powered toothbrushes. Systematic reviews also provide evidence of the safety of oscillating-rotating toothbrushes.

Summary of findings: The bristle tuft configuration is an important parameter for manual toothbrushes. Oscillating-rotating powered toothbrushes are more effective than manual toothbrushes. The safety and efficacy of oscillating-rotating toothbrushes have been established.

A complete list of references is available from the publisher.