A number of beauty salons and spas now advertise “tooth whitening” or “dental bleaching” services to their clients, and, in some cases, claim equivalence in terms of effect to procedures undertaken in dental practice. This article addresses a number of concerns about this trend, and provides specific comments on claims which are commonly made by beauty salons.

**Does it work: The wrong diagnosis?**

Reaching an accurate diagnosis of the cause of dental discolouration requires expert input from a dental professional, since only dentists are trained to diagnose the various forms of discolouration, and to select an appropriate treatment from range of available options. Traditional products based on carbamide or hydrogen peroxide, or related compounds such as chlorine dioxide, may be quite ineffective against some types of internal discolouration where the coloured molecules are not susceptible to oxidation. A dentist can advise whether the problem can be managed by various professional lightening or whitening treatments, or whether more extensive cosmetic procedures (such as veneers or crowns) are needed.

Unless external stains are removed by dental prophylaxis, a proper assessment of the nature and pattern of staining cannot be made. Moreover, the presence of surface deposits will impair the penetration of radicals into the enamel, and surface residues of saliva and pellicle will neutralize some of the applied bleaching agent, converting it into harmless oxygen and water, which will not contribute to a bleaching action. This is an important point in light of statements such as these systems “use the same technology as is used in dental offices for power whitening, and the results are comparable. The procedure has been simplified such that trained aesthetic professionals can now safely perform the whitening procedure”. The “simplification” referred to is the removal of the necessary initial prophylaxis step, and the required protective isolation steps for the gingival and oral soft tissues, thus compromising both safety and effectiveness, even if a comparable light and gel were to be used.

The abject lack of knowledge of the manufacturers and suppliers of these systems is witnessed in the form of claims such as “whitening guaranteed” and by statements such as “whitens teeth stained by tetracycline, speckled by fluoride, or hereditary discolouration”. There is no system which can treat all possible types of intrinsic discolouration. Some types of severe internal discolouration caused by iron compounds can only be treated by a restorative approach. Some patterns of tooth shade change such as fluorosis cannot be removed by bleaching, and are best treated using other strategies such as Recaldent, which can return tooth enamel to its normal colour. It would be completely inappropriate to undertake bleaching in such cases.

The use of the term “guarantee” raises three additional significant problems. Firstly, merely by allowing the teeth to dehydrate, a virtual “whitening effect” is gained as some of the tooth’s water content is lost. This effect is readily reversed as the tooth re-hydrates and is not a true change in the shade of teeth. Secondly, aging-related changes, such as dentine sclerosis, mean that vital teeth will...
continue to increase in yellow saturation with increasing age, even though this process may be interrupted, or slowed, by tooth whitening procedures. It is not possible (or wise) to guarantee that a change created by dental bleaching will persist for a certain period of time. Finally, patients may have unrealistic expectations as to the effect that can be achieved by bleaching, and in particular may have pre-conceived notions regarding the colour of teeth and the level of whiteness in teeth, that by bleaching alone are impossible to achieve.

Is it safe?
Dental bleaching of both external and internal forms of discoloration employs reactive oxygen species (ROS), particularly the hydroxyl and other radicals which penetrate readily through tooth structure. This inherent reactivity, which causes the bleaching action, explains why effective bleaching gels must also be able to cause tissue irritation and chemical burns when in contact with gingival tissue, oral mucosa, skin or eyes. Chemically speaking, there is no pathway by which one can have an effective penetrating bleaching action and an absence of safety issues.

The typical concentrations used when dentists undertake in-office bleaching involve the higher concentrations of hydrogen peroxide, typically 30% and above. Chemical accelerator systems are typically employed, e.g. by raising the pH or by introducing metallic ions or ozone, to facilitate its breakdown. This may, or may not, be supplemented with a source of intense light to facilitate the breakdown of the hydrogen peroxide into various radicals. When hydrogen peroxide is used in an in-office setting, protective materials such as flowable composite resin are applied to the gingiva and exposed root surfaces to protect them from direct contact with bleaching gel. In addition, retractors and suction are used to prevent inadvertent contact of bleaching gel with the lips or other soft tissues.

Some beauty salon bleaching treatments employ hydrogen peroxide products at concentrations up to 6%. This is above the nominal risk threshold concentration of 5% (as defined by WorkSafe Australia), meaning that safe working procedures are required and duty of care requirements of workplace health and safety legislation are invoked. The hazard rating for 3% preparations is “slight” whereas above 5%, the preparation is defined legally as a “hazardous substance”. This is an essential point since it carries a clear obligation for the user of the product to be cognizant of the hazards of the product (via a risk assessment) and to implement effective control measures to address the hazard.

There are number of published case reports on chemical burns to the oral soft tissues from hydrogen peroxide, which describe blistering of mucosal tissues and burns of oral and oropharyngeal tissues.1-10 The situation in dental bleaching where the contact time is prolonged is particularly
relevant, since adult patients will sustain tissue injury in the form of ulcerations from 30 minutes of contact with 3% hydrogen peroxide. In some beauty salons, gel is applied for some 60 minutes in a standard treatment, and no flowable protective agent is applied to the tissues. There is thus more than sufficient concentration and time for chemical injury to occur.

Patients may not necessarily experience burning sensations when their soft tissues are contaced accidentally by bleaching gels - even though significant chemical injury may have occurred. This damage - in the form of tissue blanching and ulceration - may only be noted subsequently in the gingival tissues at the cervical area, or on the lips or other mucosae (such as in the upper airway and pharynx), as a distinct white change in the tissue with associated underlying erythema (redness). Thus, areas of blanching and whiteness on the gingival tissues which occur with bleaching products, regardless of whether they are used dental professionals or beauticians, represent chemical injury to the soft tissues.1

If such chemical burns occur, immediate application of an appropriate radical scavenger (such as Vitamin E) is the required immediate treatment to neutralize oxygen free radicals that remain, and provided this is done, the affected areas of tissue should revert to their normal appearance within 15 minutes. If nothing is done, or the incorrect antidote is applied (such as sodium bicarbonate or calcium gluconate), the chemical burn will result in irreversible tissue damage. The chemical safety aspects of hydrogen peroxide are addressed in detail in the literature [See reference 1 for a relevant review].

A cold light?
Some beauty salons claim to use the same “cold-light power whitening technology seen in professional dental offices”, but which has been “specially adapted for the cosmetic beauty industry”. The actual light sources used are halogen, metal halide and LED lights, which are essentially no different in design from those used in dentistry. When intense light sources are used, the absorption of light energy into the structure of the teeth, as well as into the gingiva, is a major concern. From the standpoint of physics, there is no form of intense light which is “cold” when applied in a dental setting. Even when filters are used, conventional halogen light sources and LEDs have been shown to contribute to a level of thermal change in teeth. In other words, the issue of heat stress to the teeth is relevant to all bleaching systems which use intense light, not only to those used in a dental practice. There is no inherently “safe” light source. Rather, the spectral range of the light source employed is critical, since certain short wavelengths absorb strongly in enamel and may also cause erythema (sunburn) as well as photosensitizing reactions with particular medications such as calcium channel blockers.

Broad spectrum light sources are now being used in some beauty salons, including units which emit in the shorter wavelength (ultraviolet) ranges. Several additional risks exist for such systems. The first of these is photosensitization, the process whereby a medication which is present within tissue is activated electronically by particular wavelengths of light, resulting in the formation of oral or peri-oral lesions depending on the distribution of the intense light which has been used. Such reactions are more commonly associated with the energetic short-wavelengths of light, i.e. those in the ultraviolet region. Photo-eruptive lesions within the oral cavity and peri-oral light-induced dermatoses have been recognized as side-effects with a number of medications, some of which are used relatively common, such as calcium channel-blockers for hypertension. Whitening systems which have light sources that operate in this range provide specific information regarding medications which would exclude the patient from having exposure to these forms of light.

The second risk with UV systems is that short wavelength light in the ultraviolet spectrum can cause a sunburn-type response in the oral tissues, with associated erythema and the release of prostaglandins. If short wavelength light sources are used, extreme care must be taken to provide photo protection of the oral and peri-oral tissues.

Some beauty salons claim that their broad spectrum lights use “advanced filtration systems” that eliminates exposure to harmful UV light and to heat, yet there is no objective analysis of the spectral emissions of these lights to support such a claim. Terms such as “a safe, filtered blue light to accelerate the teeth whitening process” are unsupported by objective peer-reviewed published data in the literature.

Advertising claims
Promotional materials for products used in beauty salons do not have to pass the TGA requirements for therapeutic claims, since most peroxide products are classified at the present time as “cosmetics”.

### Table 1. Professional dental bleaching compared with beauty salon treatments

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dental practice</th>
<th>Beauty salon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operator</td>
<td>Dental professional</td>
<td>Beautician</td>
</tr>
<tr>
<td>Initial contact</td>
<td>Part of overall care</td>
<td>Opportunistic</td>
</tr>
<tr>
<td>Complete Diagnosis</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Range of treatment options</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Range of suppliers and systems</td>
<td>Yes</td>
<td>No (franchise)</td>
</tr>
<tr>
<td>Medical History</td>
<td>Routine</td>
<td>Variable</td>
</tr>
<tr>
<td>Initial Prophylaxis</td>
<td>Routine</td>
<td>Nil</td>
</tr>
<tr>
<td>Gingival protection</td>
<td>Routine</td>
<td>Nil or variable</td>
</tr>
<tr>
<td>Soft tissue isolation</td>
<td>Routine</td>
<td>Variable</td>
</tr>
<tr>
<td>Suction</td>
<td>Routine</td>
<td>Nil</td>
</tr>
<tr>
<td>Materials used</td>
<td>High potency</td>
<td>Low concentration</td>
</tr>
<tr>
<td>Light sources</td>
<td>Wide selection</td>
<td>More limited choice</td>
</tr>
<tr>
<td>Objective evidence of efficacy</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Awareness of complications</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Comprehensive follow-up</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
rather than “devices”. This unusual situation has been exploited by some manufacturers who claim that their whitening treatment “offers the best teeth whitening available”, “produces superior results to other teeth whitening options”, or words to that effect, surpassing professional in-office treatments, home gels and even laser whitening. A search of the published literature will quickly reveal that these statements come from an “evidence-free” zone in that there are no peer-reviewed clinical studies indicating such benefits. This is remarkable, given that there is an immense literature on the various professional dental bleaching treatments, and on non-professional products such as paint-on products, whitening strips and enhanced stain removal toothpastes used at the consumer level.

In summary, the profession’s adoption of evidence-based practice and the dental industry’s significant investment in quality objective research has established professional whitening treatments (from professionally supplied gels through to in-office treatment) as an effective and safe mode of treatment. Moreover, such treatments are undertaken after establishing a proper diagnosis, and in the context of a range of other treatment options (such as veneers and crowns for more difficult cases). These and other differences (Table 1) between the two approaches are obvious when the facts are considered, as opposed to marketing hype.

Disclaimer
These statements are the personal opinion of the author and do not represent the official view of the various professional associations, dental boards and universities with which I am involved. The statements attributed to advertising material for bleaching systems used in beauty salons are direct quotes taken from current (July 2008) websites.

References

About the author
Professor Laurence J. Walsh is the technology editor of Australasian Dental Practice magazine. He is also a noted commentator on and user of new technologies and is the Head of The University of Queensland School of Dentistry.