

A New System for Disclosing Plaque in the Home Setting

By Drs Mark Knapp & Barrie Gillings

IDENTIFYING PLAQUE

The profession has long recognized dental plaque as the major causative factor in most dental conditions. Increasingly this awareness is now reaching the general public. Although most people still remain unclear as to its makeup and how to detect it, the majority realize plaque is detrimental to oral health and wish to reduce it.

Preventative dentistry is a broad, multi-faceted subject but efficient toothbrushing has always been an important element of plaque control. It is rare however for brushing to be completely effective. There are a number of challenges. Many individuals lack good technique and dexterity, but most of the problems relate to the nature of plaque itself.

Often it is simply difficult for the lay person to identify. Plaque is basically tooth-coloured, making it effectively camouflaged. Furthermore it collects most readily in crevices, such as around gum margins and interproximally where the tongue cannot detect it by feel. Patients are usually unaware of how much film has collected on their teeth or where it is located.

Red Erythrosin disclosing solution (Tetra-Iodo fluorescein) has been used for many years to display plaque but it is less than ideal. It stains soft tissues, including the lips and tongue and, if not expectorated carefully, will also heavily stain clothing. Some individuals report it tastes unpleasant. Erythrosin can certainly show patients where plaque has accumulated and where brushing should improve but the profession has only used it intermittently, probably because of the staining and poor patient acceptance.

FLUORESCIN DISCLOSANT

In the 1970s Prof. Barrie Gillings published research and popularized Fluorescein dye, (which is Erythrosin without its four attached iodine atoms) as an alternative disclosant (Aust.D.J. 1977). He described how, under normal light, plaque stained with Fluorescein appeared barely discernable but, when exposed to a low energy ultra-violet light, would fluoresce bright yellow.



Fig 1: Two of Gillings' original 1977 photographs. Four day old plaque stained red with conventional Erythrosin disclosant.

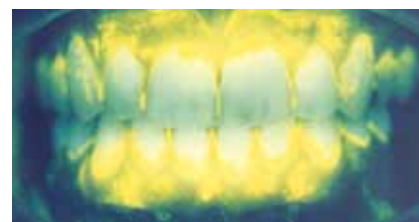


Fig 2: Plaque stained with Fluorescein disclosant fluorescing under ultra violet light. Note how plaque on the gingiva is clearly apparent.



Fig 3: Plaq Pro toothbrush with ultra violet LED light.

The light used was from commercially available 'black light blue' fluorescent lamps, as used in discotheques and advertising banners. Later, inexpensive ultra-violet LEDs, or Light Emitting Diodes, became available.

Generally, Fluorescein discloses mature, established plaque more prominently than immature formations, unless this recently formed plaque had grown rapidly in the presence of sugars. As well as displaying plaque on tooth surfaces the Fluorescein also discloses it on the gingival margins.

When plaque is made to fluoresce under UV light the effect for patients is quite spectacular and many ADA members recognized the system as

a useful educational and preventive tool for the general community. The Dental Health and Research Foundation embraced the concept and for many years sponsored a portable Plaque Disclosing Tunnel which toured multiple locations, including Royal Agricultural Shows, showing thousands of families where their toothbrushing needed to improve. It was also used by the Foundation's Dental Health Educators, who visited schools in purpose-built caravans. Invariably children enjoyed seeing their teeth from a different perspective.

Gillings wrote at the time "I believe the Tunnel displays have been successful for two reasons. First, plaque is disclosed in a most dramatic way and this makes



Fig 4: The patient has not cleaned her teeth for 24 hours. Plaque is difficult to see, particularly for the layperson.



Fig 5: After cleaning, the toothbrush is turned around, the UV light engaged and the teeth inspected for the plaque which brushing has missed.



Fig 6: The teeth under ambient white and UV light from the Plaq Pro brush. The Fluorescein disclosant shows where brushing has been ineffective and plaque remains.



Fig 7: Having identified some of the areas where plaque has collected, cleaning is more effective at the second attempt. This can be confirmed by inspecting the teeth using the toothbrush's UV light.

a great impact. Interest is stimulated and people are more receptive to a dental health message. Secondly, the fluorescent dye is virtually invisible in normal light so there is none of the embarrassment associated with the usual disclosants. The system lends admirably to self-education by patients."

While plaque could usually be viewed best on labial surfaces, with posterior buccal and palatal surfaces effectively out of sight, the disclosing raised awareness of oral hygiene and encouraged better brushing. The drawback of the original system was that, in a home setting, the disclosant had to be applied as a separate step to toothbrushing and a separate device (the light) used to show up the plaque. Dentists know it is often difficult to motivate patients to better cleaning and any extra procedures are a disincentive to improved oral hygiene.

DAILY HOME CARE

In time, interest in Fluorescein as a disclosant waned but it had unexplored potential as an aid in daily home care. Recently Gillings refined the system for home use by modifying electric toothbrushes and connecting their batteries to UV-emitting LEDs in the handles. At the same time it was suggested

that Fluorescein be incorporated into ordinary toothpaste.

This meant that, after normal brushing and rinsing, plaque removal could be assessed at home without the need for additional time consuming steps.

Teeth can now be cleaned in the usual manner, the mouth rinsed, the brush turned around and the quality of cleaning checked in the bathroom mirror using the UV light. Those areas where plaque remains can be identified and the brushing repeated with particular attention to the 'trouble spots'. Finally the teeth can be viewed again to confirm all remaining plaque has been removed.

The Fluorescein toothpaste and toothbrush/light system has now been commercialized and is available through Dentalife (Vic) under the name Plaq Pro.

Apart from containing Fluorescein, the toothpaste is designed to a somewhat different formulation. It contains an elevated level of the sweetener, Xylitol, which is known to inhibit the growth of Streptococcus mutans and also stimulate greater saliva production at a higher pH, so increasing its potential to remineralise enamel. Conversely, the paste has none of the usual hydrated silica thickener. This lowers its viscosity, but also precludes any tendency to dry the mouth.

The abrasive used is fine grade, which reduces the risk of toothbrush abrasion. Figures 4 to 7 illustrate the system in use.

The patient had been asked to refrain from brushing for twenty-four hours. An inspection of the front teeth under normal light indicated little obvious plaque, particularly to the untrained eye.

The teeth were then brushed quickly using the Fluorescein toothpaste, mimicking the type of inefficient approach which regularly fails to clean adequately. After the mouth was rinsed thoroughly, the remaining plaque appeared unchanged under ambient light but clearly shone bright yellow when exposed to the UV.

This encouraged better informed, targeted cleaning at the second attempt.

When patients brush poorly they generally lack the feedback of seeing where their cleaning has failed. It is anticipated that identifying plaque in this way could lead to a pattern of improved brushing for many of our patients. ♦

The toothpaste/ toothbrush kit may be ordered from Dentalife at www.plaqpro.com.au or Ph (03) 9879 1226.

DISCLOSURE: Mark Knapp and Barrie Gillings hold a financial interest in Dentalife's Plaq Pro.

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