

Review on Professionally Applied Disclosing Agents

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Abstract

Dental caries and periodontal diseases are plaque-mediated diseases. Poor oral hygiene and inappropriate dietary behavior can lead to increased plaque accumulation. Dental plaque is a biofilm that is formed over the teeth and prosthetic appliances placed in the oral cavity. As dental plaque is not easily visible to the naked eye, its removal is difficult and complex. To remove dental plaque and improve oral hygiene, the use of disclosing agents has been recommended. Disclosing agents are preparations containing dye or other coloring agents which are used for the identification of bacterial plaque that can be distinctly seen providing a valuable visual aid and help in the maintenance of good oral health.

Keywords: Disclosing solutions, periodontal diseases, plaque

INTRODUCTION

Dental plaque is a structured, resilient yellow-grayish substance that adheres tenaciously to the tooth surfaces, restorations, and different removable and fixed prosthetic appliances. Deposition of plaque causes inflammatory changes on the periodontium, which can lead to the destruction of tissues and loss of attachment. Usually, dental plaque is transparent, colorless, and not easily visible. Hence, an individual is not generally aware of the amount or the location of dental plaque in his/her oral cavity. Therefore, it is necessary to detect the plaque-containing areas of the oral cavity using disclosing solutions. A disclosing agent causes staining of bacterial plaque that can be an aid for patients to develop an efficient system of plaque removal.^[1]

DISCLOSING AGENTS

Removing biofilm from various areas of the oral cavity is crucial to oral disease prevention and is achieved through regular personal and professional removal. To be effectively removed with teeth brushing, it must first be accurately detected. Biofilm can be accurately localized with special dyes, mainly iodine, gentian violet, erythrosine, basic fuchsin, fast green, food dyes, fluorescein, and two-tone disclosing agents in the form of tablets, solutions, wafers, lozenges, or mouth rinses. When taken, these agents color the areas of the oral cavity where biofilm is present; the intensity of the color depends on the thickness of the plaque.

CLASSIFICATION OF DISCLOSING AGENTS^[2]

- Iodine preparations
 - Skinner's iodine solution
 - Diluted tincture of iodine mercurochrome preparations: Mercurochrome solution 50%
 - Flavored mercurochrome disclosing solution.
- Bismark Brown
- Merbromin
- Erythrosine (FD and C Red No. 3/No. 28)
- Fast Green (FD and C Green No. 3)
- Fluorescein (used with ultraviolet light source to make the agent visible)
- Two-tone solutions (FD and C Blue No. 1, FD and C Red No. 3)
- Basic fuchsin
- Crystal violet.

MECHANISM OF ACTION

Disclosing solutions work by changing the color of dental plaque so that it contrasts with the white tooth surface. Dental plaque has the ability to retain a large number of dye substances

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How to cite this article: Sasidharan S, Meeral PR. Review on professionally applied disclosing agents. *Int J Community Dent* 2021;9:104-6.

Received: 30-12-21; **Accepted:** 17-02-22; **Web Published:** 26-03-22

Access this article online

Quick Response Code:



Website:
www.ijcmmment.com

DOI:
10.4103/ijcd.ijcd_39_21

which can be used for disclosing purposes. This property is related to interaction because of the polarity difference between the components of the plaque and the dyes. The particles are bound to the surface by electrostatic interaction (proteins) and hydrogen bonds (polysaccharides).^[1]

USES^[2]

- To evaluate the effectiveness of oral hygiene maintenance
- For the preparation of plaque indices
- To personalize the patient instruction and motivation
- For self-evaluation by the patient
- For plaque control in special children
- In research studies with regard to the effectiveness of plaque control devices such as toothbrushes and dentifrices
- To evaluate the amount of removal of biofilm during and after respective periodontal surgeries.

INTERACTIONS

Plaque disclosing tablet containing PLAKSEE-MD (10 mg aryabhishek and propylparaben) has been reported to cause allergic reaction in individuals suffering from eczema.^[3]

RECENT ADVANCES

Caries risk assessment

Three-tone plaque disclosing agent containing Rose Bengal, brilliant blue, and FCF has been recently found to be effective in identifying cariogenic microbial plaque by detecting acid production by cariogenic microorganisms. In the new plaque which is sparse, the blue pigment is easily washed off giving a pink/red color, while in the case of the old plaque (>48 h plaque), the biofilm is matured and dense, so both the blue and red pigments are trapped and it gives it a blue/purple color. For extra high-risk plaque, the sucrose in three-tone plaque disclosing gel (GC Tri Plaque ID Gel) is metabolized within the plaque biofilm. Finally, the acid produced by those acidogenic bacteria lowers the plaque pH (<pH 4.5) and this helps the red pigment to disappear and gives it a light blue color.^[4]

Photodynamic therapy

Photodynamic therapy (PDT) is an established treatment for localized tumors, involving the application and retention of an applied photosensitizing agent in malignant tissues. Upon irradiation with light of an appropriate wavelength, the photosensitizer undergoes a transition from a low-energy “ground state” to a high-energy “triplet state.” This triplet-state photosensitizer can react with biomolecules to produce free radicals and radical ions or with molecular oxygen to produce singlet oxygen. These cytotoxic species can cause oxidation of cellular constituents such as plasma membranes and DNA, resulting in cell death.^[5]

A substantial body of work has shown that this photodynamic approach can also be used to kill bacteria. PDT treatment of the ubiquitous species *Staphylococcus aureus* has been

studied using photosensitizers such as hematoporphyrin, phthalocyanine, 5-aminolaevulinic acid, and photofrin.^[6] Bacteria that grow in biofilms, implicated in diseases such as cystic fibrosis (*Pseudomonas aeruginosa*) and periodontitis (*Porphyromonas gingivalis*), have been shown to be susceptible to PDT with photosensitizers such as methylene blue, toluidine blue O, and phthalocyanine.^[7]

Guided biofilm therapy whose significant novelties are the use of plaque disclosing as a visual guide and the predominant use of an air-polishing device for biofilm removal.

Plaque disclosing through tablets and liquids is a well-known tool to help patients visualize the oral plaque and improve their self-performed hygiene and compliance, both in a professional and home setting.^[8,9] It is also proven to ensure complete cleaning of molar occlusal surfaces before fissure sealing,^[10] to increase biofilm control on dentures,^[19] and to allow better debridement of root surfaces during resective periodontal surgery.^[11]

CONCLUSION

Disclosing agents can be effectively used to establish the level of the user’s oral hygiene, raise awareness of the need for biofilm removal, provide personalized instructions and incentives for better oral hygiene, facilitate user self-assessment, measure oral hygiene effectiveness, evaluate prevention and training programs for better oral hygiene, and enable studies on biofilm identification.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Chetruş V, Ion IR. Dental plaque-classification, formation, and identification. *Int J Med Dent* 2013;3:139-43.
2. Datta D, Kumar SR, Narayanan A, Selvamary AL, Sujatha A. Disclosing solutions used in dentistry. *World J Pharm Res* 2017;6:1648-56.
3. Sania MS, Aggarwal MC, Chaubey KK. An overreaction to plaque disclosing agent: An unusual case. *J Periodontal Med Clin Pract* 2016;3:51-5.
4. Jayanthi M, Shilpapiya M, Reddy VN, Elangovan A, Sakthivel R, Vijayakumar P. Efficacy of three-tone disclosing agent as an adjunct in caries risk assessment. *Contemp Clin Dent* 2015;6:358-63.
5. Dougherty TJ, Gomer CJ, Henderson BW, Jori G, Kessel D, Korbelik M, et al. Photodynamic therapy. *J Natl Cancer Inst* 1998;90:889-905.
6. Griffiths MA, Wren BW, Wilson M. Killing of methicillin-resistant *Staphylococcus aureus in vitro* using aluminium disulphonated phthalocyanine, a light-activated antimicrobial agent. *J Antimicrob Chemother* 1997;40:873-6.
7. Wood S, Nattress B, Kirkham J, Shore R, Brookes S, Griffiths J, et al. An *in vitro* study of the use of photodynamic therapy for the treatment of natural oral plaque biofilms formed *in vivo*. *J Photochem Photobiol B* 1999;50:1-7.
8. Chouchaisithi N, Santiwong B, Sutthavong S, Asvanit P. Use of a disclosed plaque visualization technique improved the self-performed, tooth brushing ability of primary schoolchildren. *J Med Assoc Thai* 2014;97 Suppl 2:S88-95.

9. Peng Y, Wu R, Qu W, Wu W, Chen J, Fang J, *et al.* Effect of visual method vs. plaque disclosure in enhancing oral hygiene in adolescents and young adults: A single-blind randomized controlled trial. *Am J Orthod Dentofacial Orthop* 2014;145:280-6.
10. Botti RH, Bossù M, Zallocco N, Vestri A, Polimeni A. Effectiveness of plaque indicators and air polishing for the sealing of pits and fissures. *Eur J Paediatr Dent* 2010;11:15-8.
11. Montevecchi M, Checchi V, Gatto MR, Klein S, Checchi L. The use of a disclosing agent during resective periodontal surgery for improved removal of biofilm. *Open Dent J* 2012;6:46-50.