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Future Trends in Chemical Plaque Control- A Review.

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ABSTRACT

Chemical plaque control' a time tested method and known for decades as an adjunct to mechanical plaque control. Many patients are unable, unwilling or untrained to practice routine effective mechanotherapy especially, children and special needs, necessitating 'Soft chemo prevention' which is desirable method of primary prevention. Right from antiseptics, antibiotics, enzymes, plaque modifying agents, plaque attachment interference agents, sugar substitutes (xylitol), essential oils to very recent nanoparticles umpteen modalities of chemical plaque control has been developed. This review aims to describe about the areas in the brighter lights of research in chemical plaque control which will unambiguously determine and revolutionize the future of chemical plaque control.

Keywords: Plaque, Plaque control, Soft chemoprevention, Chemical plaque control

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INTRODUCTION

Dental plaque has unequivocal role in the etiology of two distressing dental diseases viz. Dental caries and Periodontal diseases. 'Chemical plaque control' a time tested method and known for decades as an adjunct to mechanical plaque control. Many patients are unable, unwilling or untrained to practice routine effective mechanotherapy especially, children and special needs, necessitating 'Soft chemo prevention' which is desirable method of primary prevention [1].

The prevention of dental caries and periodontal diseases is targeted at the control of dental plaque. In this context, chemical agents could represent a valuable complement to mechanical plaque control. The active agents should prevent biofilm formation without affecting the biological equilibrium within the oral cavity [2].

Amidst expanding research in this field it's imperative to glimpse future to foresee what best it holds for the dentist and the patient.

Right from antiseptics, antibiotics, enzymes, plaque modifying agents, plaque attachment interference agents, sugar substitutes (xylitol), essential oils to very recent nanoparticles umpteen modalities and classifications has been developed from time of non-specific plaque hypothesis.

Delivery systems like Dentifrice, mouth washes, mouth rinses, lozenges, chewing gums and targeted deliveries, irrigators are appraised so far [3]. Search for an ideal agent continues with heaps of products hitting the market. Oral hygiene products rank fourth in beauty and hygiene products sales with toothpaste accounting for 58% in global oral hygiene market [4,5].

In USA Oral care products sale for the year 2004 is about 2,378 US \$ millions, In India it accounts to 617 US \$ millions.

Prospects and Research

Recent advancements in chemical plaque control are result of splendid research in material chemistry, nanotechnology and herbal agents.

The following areas in the brighter lights of research which will unambiguously determine and revolutionize the future of chemical plaque control.

Petite Particle For Perfect Plaque Patrol [6,7]

Rapidly advancing "Nanodentistry" will make possible the maintenance of 'near- perfect Oral health'

Innovation of 'Nano Hydroxyapatite crystals' a remineralising agent has shown strong propensity to adhere plaque bacteria in the oral cavity, facilitating easy removal. The remineralised zones also showed reduced plaque adherence and bacterial growth invitro.

Dentifrobots

Nanorobotic dentifrice could patrol all supragingival and subgingival surfaces, metabolizing trapped organic matter into harmless, vapours and performing continuous calculus debridement. 103-105 nanodevices per oral cavity crawl at 1-10 microns/sec. The invisible, inexpensive devices would safely deactivate themselves if swallowed. They destroy only pathogenic bacteria allowing 500 harmless species to flourish in ecosystem.

Nano drug delivery system

Is a novel method of targeted delivery system which is much researched in nanomedicine, recently striking the boundaries of dentistry. This could deliver the therapeutic agents in mouth rinses against specific pathogens.

Toothbrush Surrogates Toothpaste [8]

A Japanese research product by Dr. Kunio Komiyama, 'Soladey-J3X' - solar (light) powered toothbrush' removes plaque by chemical reaction in the mouth, could soon replace brushing with toothpaste.

When light hits solar panel in handle, electrons are released and delivered to the semiconductor head (TiO₂). This negatively charged fluid, strips H⁺ from the plaque making it easier to break down.

Substantivity – Secret of Success [9]

The success of Chlorhexidine comes from its property of substantivity. Now in an effort to find similar products, Combination of 0.3% triclosan and 2% polyvinyl methyl ether maleic acid (polymer) has demonstrated excellent substantivity, reducing proportions of vital bacteria in plaque for up to 24 hours.

Probiotics - A Prodigy [10]

A viable organic product to assist in breaking down biofilm. Much research from China, Japan and Brazil has demonstrated that probiotics can control pathogens causing dental disease by a process called competitive exclusion. Probiotics also lower the pH of the mouth. The viable strains namely Bifidobacterium and lactobacillus proved beneficial for oral health.



Anti- Nano Bacterial Mouth Rinse [11]

Recently nanobacteria were found in GCF samples from chronic periodontitis patients and implicated in calculus formation.

An anti-nanobacterial mouthwash or dentifrice containing bisphosphonates specifically etidronate and clodronate, gallium nitrate and EDTA was hypothesized as effective. Positive role of nanobacteria in caries prevention and enamel repair is also postulated..

Nurturing with Nature [12,13]

Herbal and organic chemical plaque control is evidenced from chronicles. Essential oil extracts as a plaque control agent made gyration among the existing ones, where Listerine was the first to get its FDA approval.

Time honoured ones are neem (*Azadirachta indica*), meswak (*Salvadora persica*), mango (*Mangifera indica*) extracts etc. Of late, in the queue are tea tree oil, aloe vera and propolis (bees wax), Green tea, Garlic (*Allium sativum*), onion (*Allium cepa* L), Triphala etc.

Plantibodies [14]

Impressive innovation in this field is Plantibodies which are produced by injecting antigens to specific plants which is directed against specific microorganisms with minimum side effects. Plantibodies from tobacco plant against *S.mutans* is already into invitro trials.

Exciting Enzyme Preparations

Mucinase, Mutanase, Dextranase are enzymatic preparations tried so far. New-fangled ones are amylase, lipase, protease which gave positive results invitro [15]. Papain extract was successful in reducing the *S.mutans*, *Lactobacillus* count and beneficial in gingivitis [16].

CONCLUSION

In the era of Evidence-based many products like xylitol, sorbitol and herbal products are published with insufficient data on dosing as indicated by recent reviews in literature. Hence 'Meta analysis and systematic reviews' has to be encouraged to derive conclusive recommendations.

Special needs, old aged, and children who lack compliance and manual dexterity will essentially be benefitted by chemical plaque control. Colossal progress in Nanotechnology besides research on efficient herbal products by and large would 'annihilate disparities in oral health care' and achieve twofold benefit of 'Affordability and Effectiveness'

In fruition there is promising future of Chemical plaque control with gargantuan research on wide spectrum of agents. This escalation would soon make them single most, “efficient, effective, affordable” modality for preventing dental diseases and ‘not merely an adjunct to mechanical aids.’

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