Chemical plaque control

The action of these chemical could fit into four categories:

1. Anti_adhesive.
2. Antimicromicrobial.
3. Plaque removal.
4. Anti-pathogenic.

Anti-adhesive agents; they would act at the pellicle surface to prevent the initial attachment of the primary plaque forming bacteria and development of biofilms.

Antimicrobial agents: they could inhibit plaque formation through one of two mechanisms alone or combined. The first would be the inhibition of bacterial proliferation therefore could exert their effects either at the pellicle coated tooth surface before the primary plaque formation bacteria attach or after attachment but before division of these bacteria, the second effect could be bactericidal agent ,destroys all of the microorganisms either by attaching or already attached to the tooth surface.

Plaque removal agents: in mouth rinse to reach all tooth surfaces and act in an identical manner to a tooth brush and remove bacteria from the tooth surfaces have attracted the terminology of the chemical tooth brush e.g. Hypochlorite's.

Anti-pathogenic agents: might inhibit the expression of plaque microorganism's pathogenicity without necessarily destroying them and directly approaches to alter plaque ecology to a less pathologic flora, e.g. Antimicrobial agents with bacteriostatic effect.

Chemical supra-gingival plaque control:

Chemical agents have been incorporated into mouth rinses and tooth pastes with the objective of inhibiting the formation of plaque and calculus .antiplaque agents may also have a significant clinical effect of resolving an established gingivitis.

Chlorohexidine digluconate:

CH is frequently used as a mouth rinse (0.2% or 0.12% w/v).the compound can also be applied as a gel ,spray, varnishes and has been incorporated into tooth paste, chewing gum, slow release vehicles (perio chip),periodontal packs and sub gingival irrigation.

At low concentrations, chlorhexidine is bacteriostatic, at high concentrations, it is bactericidal. The mode of action of chlohexidine in killing bacteria is dependent upon the

drug having access to cell walls. This is facilitated by electrostatic forces, since chlorhexidine is positively charged, while the phosphate and carboxyl groups of bacterial cell walls carry negative charges. Binding causes disruption of the osmotic barrier and interference with membrane transport.

Rinsing with chlorhexidine reduce the number of bacteria in saliva by between 50% and 90% .a maximum reduction of 95% occurs around 5 days, after which the numbers of bacteria increase gradually to maintain an overall reduction of 70 %-80% at 40 days.

Clinical uses of chlorhexidine:

1. as an adjunct to oral hygiene and professional prophylaxis.
2. Post oral surgery including periodontal surgery or root planning.
3. for patients with jaw fixation.
4. Medically compromised individual predisposed to oral infections.
5. High risk caries patients.
6. in denture stomatitis.
7. Oral mal odor.
8. Recurrent oral ulceration.
9. Removable and fixed orthodontic appliance wearers.
10. Immediate preoperative chlorhexidine rinsing and irrigation.
11. reduced salivary flow.
12. for oral hygiene and gingival health benefits in the mentally and physically handicapped.

In oral use as a mouth rinse chlorhexidine has been reported to have a number of local side effects, thus it is only used for a few weeks at a time when it is not possible to carry out other oral hygiene procedures.

These side effects are;

1. Brown discoloration of the teeth and some restorative materials and the dorsum of the tongue.
2. Taste perturbation where the salt taste appears to be preferentially affected to leave food and drinks with a rather bland taste.
3. enhanced supra_gingival calculus formation.
4. Unilateral or bilateral parotid swelling.
5. Oral mucosal erosion.

6. Chlorhexidine also has a bitter taste which is difficult to mask completely.

CH is nontoxic even if digested or topically applied and has abroad antimicrobial action including wide range of gram positive & gram negative m.o. it is also effective against fungi and yeast including candida and some viruses (HBV & HIV).no report of bacterial resistance even after prolong uses of CHX were recorded.

Studies suggest a slow release of CHX from surfaces to produce a persistent bacteriostatic action lasting for about 12hr. that's why it should be used twice a day.

Antimicrobials:

The use of systemic antimicrobials in the management of periodontal disease should be restricted to the following conditions

1. Sever necrotizing ulcerative gingivitis.
2. Multiple o sever periodontal abscesses with involvement of regional lymph nodes.
3. Some cases of aggressive periodontitis.
4. Refractory periodontitis.

Rout of administration:

It is impossible to mechanically remove plaque completely from narrow grooves, narrow furcation's and other bacterial reservoirs within the pockets. Thus it is appropriate to combine mechanical plaque control with antimicrobials. Since only a few bacterial species are potentially periodontal pathogenic, it is reasonable to eliminate these groups specifically .these groups contain bacteria can invade periodontal tissues, making mechanical therapy alone in-effective.

Within the periodontal environment a concentration of the drug that is sufficient either to kill (bactericidal) or arrest growth (bacteriostatic) of pathogenic microorganisms.

Systemically ingested antimicrobials, whereby the drug enters the crevicular fluid and able to bathe sub-gingival flora.

Advantages:

.Eliminating pathogens, not only from periodontal lesions but also from the oral cavity. (Reach widely distributed microorganisms).

.Such an action may have prophylactic benefits and reduce the risk of reinfection of the periodontal sites.

.broad spectrum of activity.

Disadvantages:

-systemic side effects.

-the possible elimination of non-pathogenic “beneficial” bacteria.

-low concentration within the tissues.

-bacterial resistance.

-requires good patient compliance.

-interaction with other medications.

-Allergic reactions.

-Super infections of opportunistic bacteria.

-High doses of antimicrobials are administered.

Advantages of local route of administration:

-lower doses of antimicrobials are administered.

-High local concentrations of the drugs are achieved locally in periodontal pockets so better effect against biofilms.

-Minimal or no side effects.

-Administration is not dependent upon patient compliance.

-placement is site specific.

-When the matrix (vehicle) biodegrades to release the drug (controlled slow release device), an antimicrobial sustain its localized concentration of effective levels for a sufficient time.

Disadvantages:

-Narrow, limited spectrum of efficacy.

-Possible reinfection of non-treated sites.

-The placement can be time consuming when the treatment of multiple sites is indicated.

-The extent to which the drug penetrates the connective tissues may be less predictable than when systemic dosing is undertaken.

Tetracycline:

Is a group of related bacteriostatic antimicrobials .they provide a broad spectrum of activity against both gram-positive and gram-negative microorganisims.tetracycline is effective against most spirochetes and many anaerobic and facultative bacteria. Additional properties of tetracycline that may be valuable in the management of periodontal disease are

-inhibition of collagenase (inhibit tissue destruction).

-Anti-inflammatory actions.

-Enhancement of fibroblast attachment to root surfaces.

-inhibition of bone resorption and may aid bone regeneration.

-High drug concentration to be delivered into pocket (concentration in gingival sulcus 2-10 time that in serum).

In chronic periodontitis, systemic tetracycline has little advantage when used as an adjunct to other procedures. Systemic tetracycline is valuable in the management of localized aggressive periodontitis and refractory periodontitis .in localized aggressive periodontitis, the prime pathogen is aggregatibacter actinomycetem comitance (A.a), which is very susceptible to tetracycline.

Sub –antimicrobial dose of doxycycline 20mg 2⁄d for 3 months for maximum of 9 months approved and indicted as an adjunct to S&RP in the treatment of periodontal disease, e.g. refractory periodontitis, which act by a mechanism called host modulation that refers to the concept of modulating the host response to the presence of bacteria with methods such as inhibiting collagen destructive enzymes hence, this regimen create no bacterial resistance.

Tetracycline has been incorporated into slow release devices for adjunctive local treatment following S&RP .e.g. Minocycline ointment, also been available for local application.

Metronidazole:

Antibacterial activity against anaerobic –cocci, gram –negative and gram-positive bacilli has led to the use of metronidazole in the treatment of periodontal disease.

In the cell ,metronidazole binds and disrupts DNA synthesis leading to cell death .this process results in rapid killing of anaerobic microorganisms (bactericidal).it is effective against prophyromonas gingivalis.

In periodontal treatment, metronidazole has been used systemically; common dosage is 200mg three times a day for 3-5 days. For more severe infections the dose is increased to 400mg twice daily for 3-5 days.

Metronidazole has been found to be very effective when combined with amoxicillin in the treatment of refractory localized aggressive periodontitis that has not responded to conventional periodontal treatment and tetracycline therapy. A 7 days (250mg of each drug).

Efficacies studies suggest that two applications of 25% metronidazole gel (1 week apart) in periodontal pocket are as effective as conventional non-surgical management in reducing probing depths and bleeding on probing.

Amoxicillin:

Had extended antimicrobial spectrum that includes gram positive and gram negative bacteria by inhibiting bacterial cell wall production and therefore are bactericidal, hence may be useful in the management of patients with aggressive periodontitis, the dosage is 500mg for 8 days.

Augmentin (Amoxicillin with clavulanate), this combination makes it resistant to penicillinase enzymes produced by some bacteria, hence may be useful in the management of patients with refractory or localized aggressive periodontitis. The Augmentin with Metronidazole combination have an additive effect regarding suppression of A.a in localized aggressive periodontitis.

Nonsteriodal Anti-inflammatory Drugs (NSAID):

May be of therapeutic value in treating periodontal disease because of their ability to inhibit the inflammatory process, drug such as flurbiprofen, ibuprofen, mefenamic acid and naproxen.