

Antibiotics in Periodontal treatment

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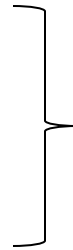
Introduction

- Periodontal diseases result from susceptible hosts having specific oral pathogens, that they are found in high number that overcome the host defense mechanism
- In certain types of periodontal disease including:
 - Chronic advanced periodontitis.
 - Aggressive periodontitis.
 - Periodontitis as a manifestations of systemic diseases.

Treatment modalities for periodontal diseases :

Non – Surgical treatment

Surgical treatment



Mechanical debridement



ANTIBIOTICS

- Adjunctive chemotherapeutic agents may be necessary to control the disease process.

Definitions

Chemotherapeutic agent is a general term for a chemical substance that provides a clinical therapeutic benefit.

Clinical benefits can be derived through:

1. antimicrobial actions.
2. increase in the host's resistance

Antimicrobial agent: is a chemotherapeutic agent that works by reducing the number of bacteria present.

Antibiotics are a naturally occurring, semisynthetic or synthetic type of antimicrobial agent that destroys or inhibits the growth of selective microorganisms, generally at low concentration.

• **Antiseptics** are chemical antimicrobial agents that are applied topically or subgingivally to mucous membranes, wounds, or intact dermal surfaces to destroy microorganisms and inhibit their reproduction or metabolism.

Antiseptics examples as the active ingredient in antiplaque and antigingivitis mouthrinses and dentifrices.

• **Disinfectants** a subcategory of antiseptics, are antimicrobial agents that are generally applied to inanimate surfaces to destroy microorganism.

Chemotherapeutic agents can be administered:

- Locally
- Orally.
- Parenterally.

Rationale for the use of antibiotics for treatment of periodontal disease:

- ✓Systemic antibiotics may be a necessary adjunct in controlling bacterial infection because bacteria can invade periodontal tissues, making mechanical therapy alone sometimes ineffective.
- ✓Local administration of antimicrobial agents, generally directly in the pocket, has the potential to provide greater concentrations directly to the infected area and reduce possible systemic effects.



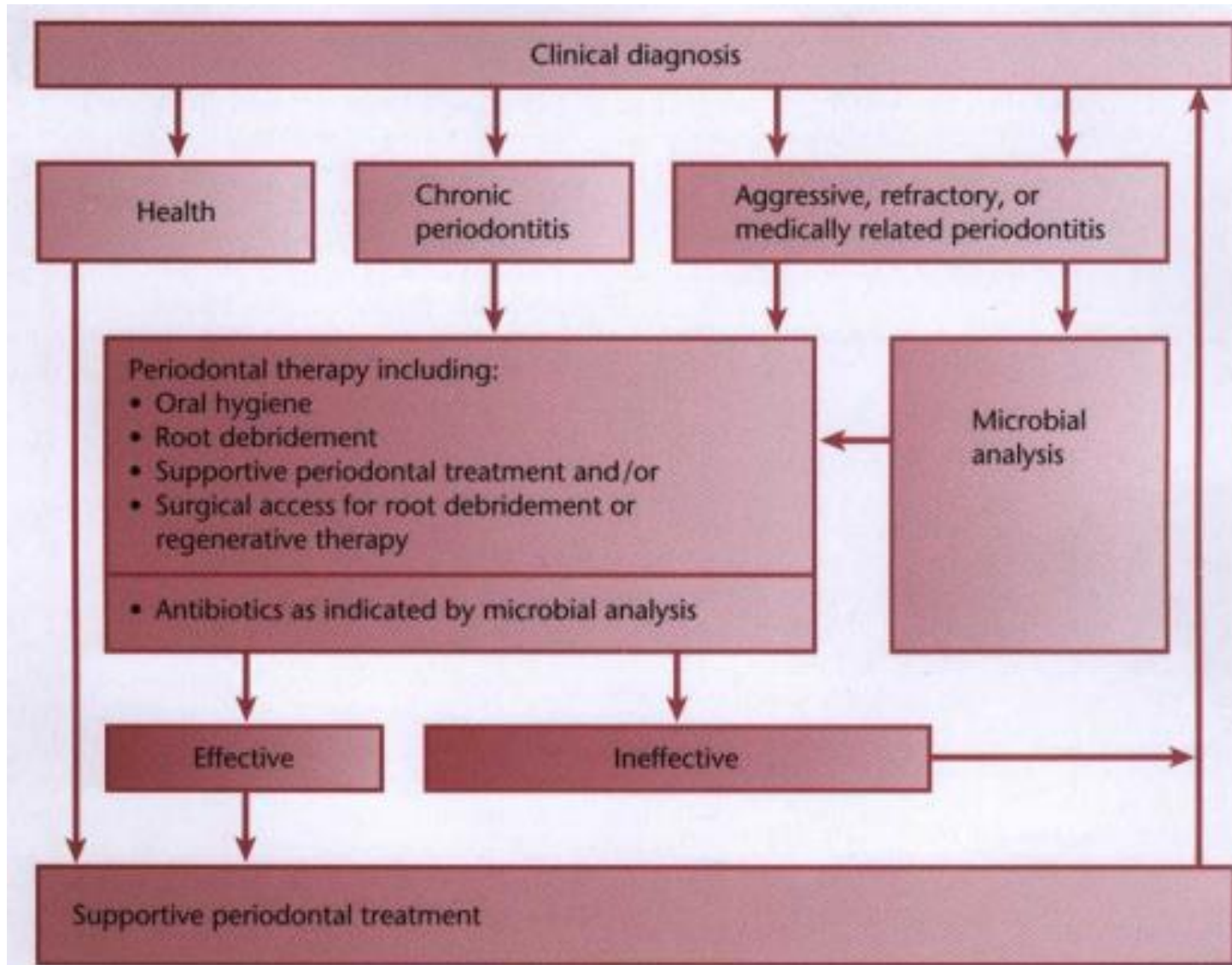
SYSTEMIC ADMINISTRATION OF ANTIBIOTICS

The possible clinical benefits of administering antibiotics to help control periodontal disease must be weighed against possible adverse reactions.

Some adverse reactions include:

- Allergic/anaphylactic reactions
- Superinfections of opportunistic bacteria
- Development of resistant bacteria.
- Interactions with other medications.
- Upset stomach nausea,
- Vomiting.

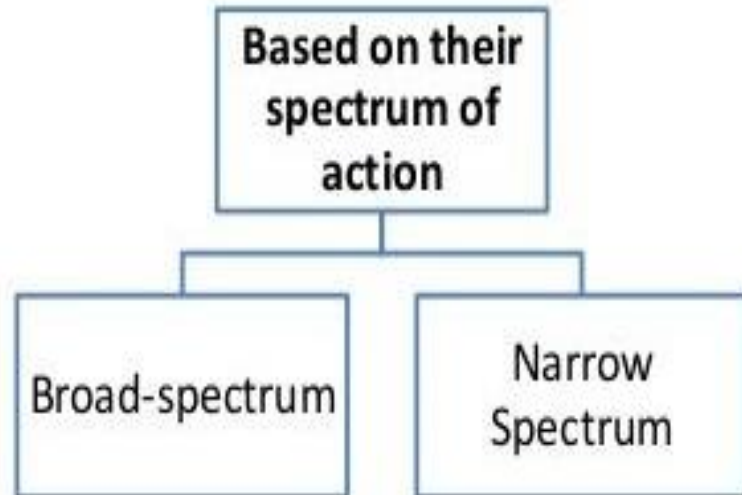
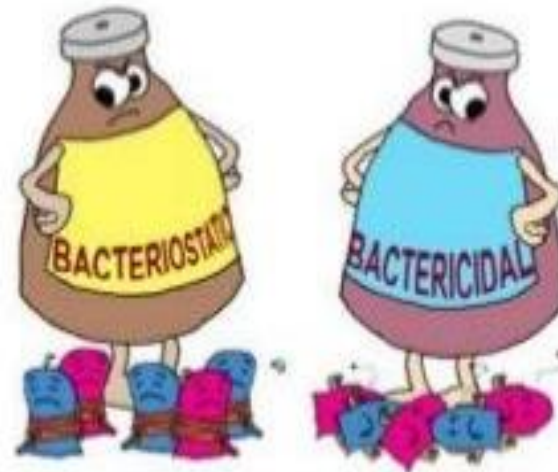
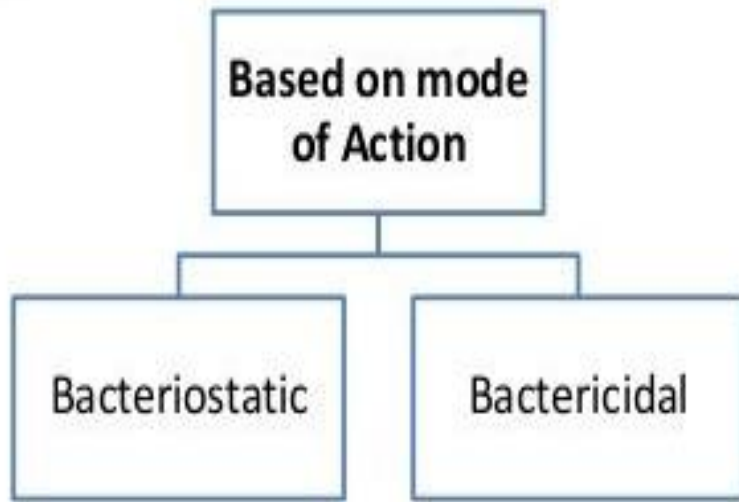
Guidelines for use of antibiotics in periodontal therapy



Guidelines for use of antimicrobial therapy



Classification of Antibiotics



Cell Wall Synthesis

Beta Lactams

Penicillins
Cephalosporins
Carbapenems
Monobactams

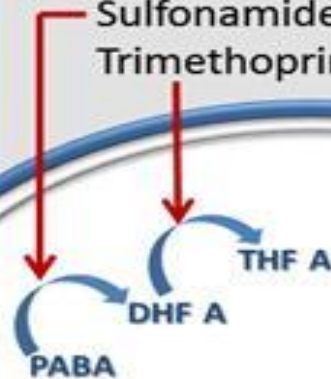
Vancomycin
Bacitracin

Cell Membrane

Polymyxins

Folate synthesis

Sulfonamides
Trimethoprim



Nucleic Acid Synthesis

DNA Gyrase

Quinolones

RNA Polymerase

Rifampin

50S subunit

Macrolides
Clindamycin
Linezolid
Chloramphenicol
Streptogramins

30S subunit

Tetracyclines
Aminoglycosides

Protein Synthesis

Commonly used antibiotics in periodontal therapy:

- Tetracycline
- Amoxicillin
- Metronidazole
- Ciprofloxacin
- Azithromycin
- clindamycin



Tetracyclines

Tetracyclines have been widely used in the treatment of periodontal diseases.

They have been frequently used in treating refractory periodontitis, including localized aggressive periodontitis.

Mechanism of action

- Tetracyclines have the ability to concentrate in the periodontal tissues and inhibit the growth of *Actinobacillus actinomycetemcomitans*.
- In addition, they exert an anticollagenase effect that can inhibit tissue destruction and may aid bone regeneration

Pharmacology

Bacteriostatic in action.

- ✓ More effective against gram-positive bacteria than gram-negative bacteria.
- ✓ Tetracyclines are effective in treating periodontal diseases in part because their concentration in the gingival crevice is 2 to 10 times that in serum.
- ✓ Absorption altered by calcium, metal ions, or antacids.

Members of the tetracycline group

TETRACYCLINE. Tetracycline requires administration of 250 mg qid. It is compliance may be reduced by having to take four capsules per day.

MINOCYCLINE: can be given twice a day, thus facilitating compliance when compared with tetracycline.

Although it is associated with less photo- and renal toxicity than tetracycline, it may cause reversible vertigo.

Minocycline administered in a dosage of 200 mg per day for 1 week results in a reduction in total bacterial counts.

DOXYCYCLINE. Doxycycline has the same spectrum of activity as minocycline and may be equally as effective." Because it can be given only once daily, patients may be more compliant.

The recommended dosage when used as an antimicrobial agent is 100 mg twice daily the first day, then 100 mg once daily.

Metronidazole

Pharmacology:

- Metronidazole is a nitroimidazole.

It is bactericidal to anaerobic organisms and is believed to disrupt bacterial DNA synthesis.

- It is effective against *A. actinomycetemcomitans* when used in combination with other antibiotics.

- Metronidazole is also effective against anaerobes such as *Porphyromonas gingivalis* and *Prevotella intermedia*.

Clinical Usage.

- Metronidazole has been used clinically to treat acute necrotizing ulcerative gingivitis, chronic periodontitis, and aggressive periodontitis.
- It has been used as monotherapy and also in combination with both root planing and surgery.
- The most commonly prescribed regimen is 250 mg tid for 7 days
- Combination therapy: amoxicillin or amoxicillin-clavulanate potassium (Augmentin), metronidazole may be of value in the management of patients with localized aggressive or refractory periodontitis

Side Effects.

- Metronidazole has an antabuse effect when alcohol is ingested. The response is generally proportional to the amount ingested and can result in severe cramps, nausea, and vomiting.
- Products containing alcohol should be avoided during therapy and for at least 1 day after therapy is discontinued.
- Metronidazole also inhibits warfarin metabolism. Patients undergoing anticoagulant therapy should avoid metronidazole because it prolongs prothrombin time.
- It also should be avoided in patients who are taking lithium.

Penicillins

Pharmacology:

- Penicillins are the most widely used antibiotics.
- Penicillins are natural and semisynthetic derivatives of broth cultures of the *Penicillium* mold.
- Bactericidal in action.

Side Effects. Penicillins may induce allergic reactions and bacterial resistance; up to 10% of patients may be allergic to penicillin.

Amoxicillin

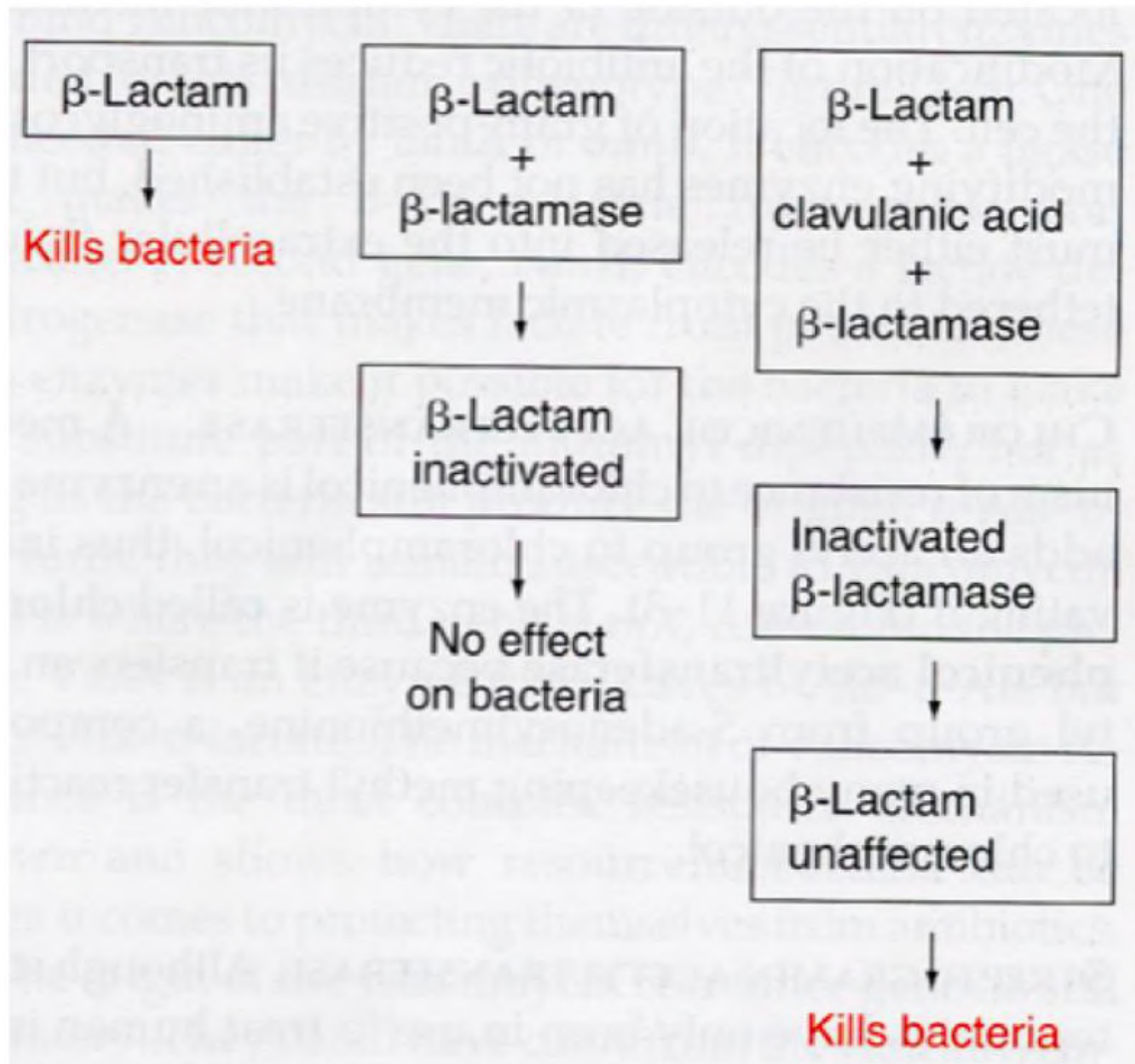
May be useful in the management of patients with aggressive periodontitis, both in the localized and generalized forms. Recommended dosage is 500 mg tid for 8 day.

Amoxicillin-Clavulanate (Augmentin).

500mg + 125 mg = 625mg

resistant to penicillinase enzymes produced by some bacteria. Type equation here.

Augmentin may be useful in the management of patients with refractory or localized aggressive periodontitis.



Clindamycin

Pharmacology:

Clindamycin is effective against anaerobic bacteria.

It is effective in situations in which the patient is allergic to penicillin.

Clinical Usage.

In patients with periodontitis refractory to tetracycline therapy.

150 mg qid for 10 days or 300 mg twice daily for 8 days.

Side Effects

Pseudomembranous colitis

Diarrhea or cramping.

If symptoms persist, the patient should be referred to an internist.

Ciprofloxacin

Pharmacology.

Ciprofloxacin is a quinolone active against gram-negative rods.
500mg tid for 8 days.

Clinical Usage.

At present, ciprofloxacin is the only antibiotic in periodontal therapy to which all strains of *A. actinomycetemcomitans* are susceptible. It also has been used in combination with metronidazole.

Side Effects.

✓ Nausea, headache, and abdominal discomfort have been associated with ciprofloxacin.

✓ Quinolones inhibit the metabolism of theophylline, and caffeine and concurrent administration can produce toxicity.

✓ Quinolones have also been reported to enhance the effect of warfarin and other anticoagulants.

Macrolides

Pharmacology.

- They inhibit protein synthesis.
- They can be bacteriostatic or bactericidal, depending on the concentration of the drug and the nature of the microorganism

Clinical Usage:

1. Erythromycin

- It is not effective against most putative periodontal pathogens.
- It is not recommended as an adjunct to periodontal therapy.

Azithromycin (Zithromax)

- Is a member of the azalide class of macrolides.
- It is effective against anaerobes and gram-negative bacilli.
- After an oral dosage of 500 mg once daily for three consecutive days, significant levels of azithromycin can be detected in most tissues for 7 to 10 days.
- Therapeutic use requires a single dose of 250 mg per day for 5 days after an initial loading dose of 500.



SERIAL AND COMBINATION ANTIBIOTIC THERAPY

General points

- No single antibiotic is effective against all putative pathogens.
- It may be necessary to use more than one antibiotic, either serially or in combination.
- Before combinations of antibiotics are used, the periodontal pathogen(s) being treated must be identified and antibiotic susceptibility testing performed.

Clinical usage

- Antibiotics that are bacteriostatic (e.g., tetracycline) generally require rapidly dividing microorganisms to be effective.
- They do not function well if a bactericidal antibiotic (e.g., amoxicillin) is given concurrently.
- When both types of drugs are required, they are best given serially, not in combination.

Combination therapy

- ❑ Metronidazole and amoxicillin are clinically effective in treating localized aggressive periodontitis.
- ❑ Metronidazole-ciprofloxacin combination is a powerful combination against mixed infections.

Selection of specific agents should be guided by the results of cultures and sensitivity tests for subgingival plaque microorganisms.



LOCAL DELIVERY OF ANTIBIOTICS

Tetracycline-Containing Fibers (Actisite)

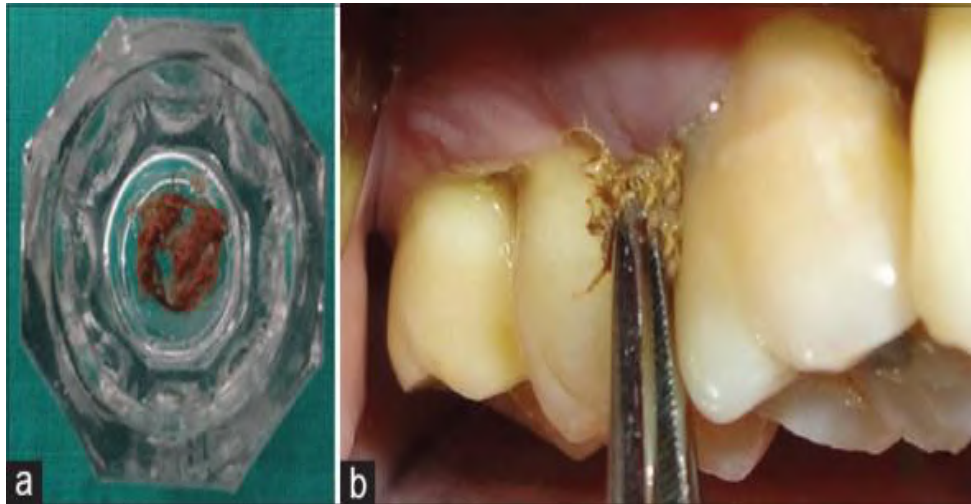
- The first local delivery product.
- Is an ethylene/vinyl acetate copolymer fiber, diameter 0.5 mm, containing tetracycline, 12.7 mg/9 inches (Actisite tetracycline fiber; manufactured by Alza Corporation, Palo Alto, CA; distributed by Procter & Gamble Co., Cincinnati, OH).
- When packed into a periodontal pocket, it is well tolerated by oral tissues, and for 10 days it sustains tetracycline concentrations.
- Crevicular fluid concentrations achieved by Actisite are more than systemic administration.

Advantages:

- Reduction in probing depth, bleeding on probing, and periodontal pathogens
- Gain in clinical attachment level.
- In a 2-month study, compared with scaling and root planing, the fibers used alone have provided more than a 60% greater improvement in probing depth and clinical attachment level than scaling alone.
- No change in antibiotic resistance to tetracycline has been among the tested putative periodontal pathogens.

Disadvantages:

- The length of time required for placement (10 minutes or more per tooth).
- Placement of fibers around 12 or more teeth has resulted in oral candidiasis in a few cases.



Tetracycline-Containing Fibers (Actisite)

Subgingival Delivery of Doxycycline (Atridox)

- Atridox® (manufactured by Atrix Laboratories, Fort Collins, CO; licensed for marketing by Block Drug, Inc., Jersey City, NJ).
- Is a gel system that incorporates the antibiotic doxycycline (10%) in a syringeable gel system.
- Some studies showed reduction in probing depth and gain in clinical attachment over 9 months.



Syringeable gel system

Subgingival Delivery System for Minocycline (Dentamycin and PerioCline)

- A subgingival delivery system of 2% (w/w) minocycline hydrochloride (Dentamycin, Cyanamid International, Lederle Division, Wayne, NJ; PerioCline, SunStar, Osaka, Japan).
- This system is a syringeable gel suspension delivery formulation.
- Reduction of probing depth and bleeding index.
- Gaining in clinical attachment and reduction in the periodontal pathogen count.

Subgingival Delivery of Metronidazole

- A topical medication (Elyzol; Dumex, Copenhagen, Denmark) containing an oil-based metronidazole 25% dental gel (glyceryl mono-oleate and sesame oil) has been tested in a number of studies.
- It is applied in viscous consistency to the pocket, where it is liquidized by the body heat and then hardens again forming crystals in contact with water.
- Studies showed reduction in all clinical parameters with application of gel in 6 months follow up study.

