ANTIBIOTIC THERAPY IN PEDIATRIC DENTISTRY

A. GENERAL INDICATIONS FOR ANTIBIOTIC USE IN CHILDREN

1) Cellulitis
2) Acute Dental Infection
3) Dental Abscess
4) Orofacial and Dentoalveolar Trauma
5) The Non-Healing Wound
6) Antibiotic Prophylaxis

B. IS AN ANTIBIOTIC NECESSARY ?

ANTIBIOTIC THERAPY INDICATED
Trismus, fever and/or chills
Cellulitis not localized and advancing
Weakness, dizziness, rapid respirations

ANTIBIOTIC THERAPY NOT INDICATED
Uncomplicated procedural edema, alveolar osteitis, pericomitis
Pain secondary to pulpitis or trauma
Nonvital tooth draining sinus tract

C. PATIENT-SPECIFIC CRITERIA

1. HOST DEFENSES AND ANTIMICROBIAL MECHANISM OF ACTION

BACTERIOSTATIC AGENTS
Tetracyclines Sulfas
Macrolides
Clindamycin*

BACTERICIDAL AGENTS
Penicillins Cephalosporins
Metronidazole Vancomycin
Fluoroquinolones Aminoglycosides

2. THE COMPROMISED HOST

a) DISEASE
- Poorly controlled diabetes
- Malnutrition secondary to alcoholism or disease
- Neoplastic disease and radiation therapy

b) DRUG THERAPY
- Immunosuppressives:
  - Glucocorticoids (B &T)
  - Azathioprine (B&T) and Cyclosporine (T)
- Cytotoxic agents:
  - Methotrexate

3. OTHER HOST FACTORS

a) ALLERGY - history must be taken frequently, allergenicity greatest in childhood
b) AGE - achlorhydria, other meds, compliance based on taste for children
c) PREGNANCY
- -FDA pregnancy classifications : A,B,C,X

d) RENAL FAILURE
- - Contraindicated: tetracycline HCl
- - Dosage reduction: amoxicillin, ampicillin, cephalexin, ciprofloxacin, vancomycin
- - No dosage change: erythromycin, clindamycin, doxycycline, dicloxacillin, metronidazole, cefaclor

e) SITE OF INFECTION - must be able to obtain MIC at site of infection

D. COMMON ORAL PATHOGENS

AEROBIC GRAM POSITIVE COCCI

Alpha-hemolytic strep	43%
Staph epidermis	14%
Strep (non-specific)	10%
Beta-hemolytic strep	7%
Staph aureus	6%

ANAEROBIC SPECIES

Gram + cocci
Peptococcus* 38%
Peptostrep* 29%

Gram + rods
Eubacterium 14%

Gram - cocci
Veillonella 9%

Gram - rods
Fusobacterium 25%
Bacteriodes 92%

E. DENTAL DRUG REFERENCE
- drugs listed by generic, indexed by brand, non-comparative, incomplete
- authored by Gage, published by Mosby
-1st ed. 1994 (ISBN 08016-7851-X) price $29.95

F. DRUG INFORMATION COMPUTER SOFTWARE

1. *DRUG FACTS ELECTRONIC VERSION BY DRUG FACTS & COMPARISONS*
- provides drug information monographs and performs drug interaction searches
- cost $300 for individual, phone: 1-800-223-0554, demo diskette available,

2. *ASK-RX*
- by Camdat, for comprehensive, full-text information using USP DI database
- updated yearly in May. Clipboard allows for entry of individual patient data and Rx
- $195 subscription fee/year. Phone: 1-800-875-8355

III. PATIENT MANAGEMENT REFERENCES FOR PEDIATRIC DENTISTRY

A DENTAL MANAGEMENT OF THE MEDICALLY COMPROMISED PATIENT
- authors: James Little/Donald Falace
- Mosby 4th ed. 1993 (ISBN 0-8016-6837-9) price $40

B. MEDICAL EMERGENCIES IN THE DENTAL OFFICE
- author: Stanley F. Malamed
- Mosby 4th ed. 1993 (ISBN 0-8016-6386-5) price $43

C. SEDATION: A GUIDE TO PATIENT MANAGEMENT
- author: Stanley F. Malamed
- Mosby 3rd ed. 1995 (ISBN 0-8016-3210-2) price $45

D. CURRENT PEDIATRIC DIAGNOSIS AND TREATMENT
- edited by Hay, Groothius, Hayward and Levin
Lange 12th ed. 1995 (ISBN 0-8385-1446-4) price $41.95

E. PEDIATRIC DENTRISTY: INFANCY THROUGH ADOLESCENCE
- edited by Pinkham, Casamassimo, Fields, McTigue and Nowak
- Saunders 2nd ed. 1994 (ISBN 0-7216-4695-6) price $63

F. THE HARRIET LANE HANDBOOK; A MANUAL FOR PEDIATRIC HOUSE OFFICERS
- edited by Johnson
- Mosby 13th ed.1993 (ISBN 0-8016-8000-X) price $29.95

G. PEDIATRIC DOSAGE HANDBOOK
- authors Taketomo, Hodding, Kraus
- APhA 1995 ed. available 6/1/95, price $29.50
-APhA customer service: 1-800-237-2742, FAX: 1-202-783-2351

H. POCKET BOOK OF PEDIATRIC ANTIMICROBIAL THERAPY
- authored by Nelson
- Williams and Wilkins 11th ed. 1995 (ISBN 0-683-06406-1) price $13.95

I. SWEETENER CONTENT OF COMMON PEDIATRIC ORAL LIQUID MEDICATIONS
- authors Hill, Flaitz, Frost
- American Journal of Hospital Pharmacy 1988; 45:135-42.

J. THE PAIN DRUGS HANDBOOK
- authored by Omoigui
- Mosby 1995 (ISBN 0-8151-6505-6) price $28

1. The typical odontogenic infection is composed of a mix of aerobic and anaerobic species
2. The timeline of infection may show: AEROBES——MIXED——ANAEROBES.
3. Obtain cultures & sensitivities for: antibiotic failures, recalcitrant infections, suspected osteomyelitis, impaired host defenses, post-op wound infections, etc.

E. ANTIBIOTIC THERAPY GUIDELINES

Antimicrobial prescribing in the U.S. : 80 % empirical therapy
10% prophylactic coverage
10% definitive therapy - after C & S

- Target causative organism -empirical or lab
- Patient drug and medical history - ALLERGIES ?
- Patient counseling - adverse effects, compliance, cost
- Positive response expected in 48 hours
- Continue therapy 3 days after symptoms resolve
- Combination therapy: 3 possible effects - indifferent (additive) - synergism - antagonism
  Cidal + Cidal *or* Static + Static

F. ORAL PENICILLINS

ORAL PENICILLINS USEFUL IN DENTISTRY

Classification	PEDS DOSAGE mg/kg/day	OK with food?	Usual adult regimen	activity against oral pathogens Gm+ Aerobes	Gm- Anaerobes	Gm+ Anaerobes
Natural						
Penicillin G, benzathine	50KU/kg	no	400,000u q6-8h	+	+	+
Penicillin VK	25-50	yes	250-500mg qid	+	+	+,-
Penicillinase-Resistant						
Dicloxacillin	12-25	no	250mg q6h	staph only	-	-
Nafcillin	50-100	no	500mg qid	staph+strep	-	-
Aminopenicillins						
Amoxicillin	20-40	yes	250-500mg q8h	+	+	-
Amox/potassium clavulanate (Augmentin)	40	yes	250-500mg q8h	+	+	-
Ampicillin	50-100	no	250-500mg qid	+	-	-

1. INDIVIDUAL AGENTS

Amoxicillin advantages over ampicillin
- 2-4 fold better absorption
- spectrum of activity
- may be taken with food
- TID administration

2. ADVERSE EFFECTS

Hypersensitivity

- 3 - 10 % of population is allergic to penicillins (more frequently with IV/IM than PO route)
- IgE Mediated acute reaction - PCN binds to protein and acts as a hapten to which Ab develop
- True anaphylactic reactions to penicillin are 1/7,000 to 1/25,000 instances of PCN use
  - *mortality occurs once in every 50,000 - 60,000 treatment courses
  - * sx. begin 10-20 min. after ingestion, antihistamines are of little effect
- Cross-reactivity to cephalosporins occurs in 3-5% of patients
  - *Cephalosporins are contraindicated with pt history of severe or immediate penicillin reaction (urticaria, angioedema, anaphylaxis)

3 DRUG INTERACTIONS

Bacteriostatic antibiotics
Oral contraceptives
Methotrexate

G. ORAL CEPHALOSPORINS

Oral Cephalosporins Useful in Dentistry						
Classification	PED DOSAGE mg/kg/da	OK with food?	Usual adult regimen	activity against oral pathogens Gm⁺ Aerobes	Gm⁻ Anaerobes	Gm⁺ Anaerobes
First Generation						
Cephalexin (Keflex,g)	25-50	yes	250-500mg qid	+	-	-
Cefadroxil(Duricef,Ultracef,g)	30	yes	500mg bid or 1g/d	+	-	-
Cephradine(Anspor,Velosef,g)	25-50	yes	250-500mg qid	+	-	-
Second Generation						
Cefaclor (Ceclor)	40	yes	250mg q8h	+	?	+,-
Cefuroxime (Ceftin)	30-40	yes	250-500mg q12h	+	+	+
Cefprozil (Cefzil)	30	yes	250mg q12h or 500mg q12-24h	+	?	?
Cefpodoxime (Vantin)	10	yes	100-400mg q12h	+	?	-
Loracarbef (Lorabid)	15-30	no	200-400mg q12h	+	?	-,?
Third Generation						
Cefixime (Suprax)	8	yes	200mg q12h or 400mg/day	+	-	-

1. INDIVIDUAL AGENTS

1st generation: best gram + coverage of all cephalosporins
2nd generation: best anaerobe coverage - Ceftin suspension now available
3rd generation: no anaerobic advantage over first generation
4th generation: ? some gram +, value in dentistry remains to be seen

2. ADVERSE EFFECTS

Hypersensitivity
Oral candidiasis

3. DRUG INTERACTIONS

Bacteriostatic antibiotics
Anticoagulants
Antacids, H_2 blockers

H. ORAL MACROLIDES

Oral Macrolides Useful in Dentistry						
Drug	Tpeak(h)	OK with food?	Usual adult regimen	activity against oral pathogens Gm⁺ Aerobes	Gm⁻ Anaerobes	Gm⁺ Anaerobes
Erythromycin Base						
Abbott Filmtab	3	no	250-500mg q6h	+	-	-
Boots E-Mycin (EC)	6	yes	250mg q6h or 333mg q8h	+	-	-
Abbott Ery-Tab (EC)	3f, 2nf	yes	250-500mg q6h or 333mg q8h	+	-	-
Abbott PCE (PC)	3	no?	333mg q8h or 500mg q6-12h	+	-	-
P-D ERYC (EC)	3	no	250mg q6h	+	-	-
Erythromycin Ethylsuccinate						
Abbott E.E.S., generic	2	yes	400mg q6h	+	-	-
Erythromycin Stearate						
Abbott Erythrocin	3	no	250-500mg q6h	+	-	-
Azithromycin (Zithromax) (not for < 15years)	2-3	no	250mg bid day 1 then 250mg qd days 2-5	+	+,-	-
Clarithromycin (Biaxin)	1.7	yes	250-500mg q12	+	+,-	+

4. Predisposing factors/ risk factors include:
recent hospitalization, recent broad-spectrum antibiotic use, history of colitis, advanced age, recent instrumentation of lower bowel

d) Signs and Symptoms of AAC
profuse, watery diarrhea 1-20 times/day, bloody diarrhea in 5-10 % of cases, foul smelling, abdominal cramping, nausea, fever and leukocytosis
* may occur up to 10 weeks after discontinuation of the antimicrobial agent

c). Drug interactions:

Succinylcholine	Erythromycin	Kaolin-Pectin

2. METRONIDAZOLE

a). Adverse effects: Taste disturbances
Peripheral neuropathy
GI irritation (no oral suspension available)

b). Drug interactions

Anticoagulants	Disfulfuram	Ethanol (IV diazepam, IV SMZ/TMP)
Lithium	Phenytoin	

c) Characteristics of Metronidazole

ADVANTAGES:
- bactericidal
- good bone penetration
- great efficacy against oral anaerobes
- inexpensive, can be given with penicillin VK

DISADVANTAGES:
- no oral suspension available
- no efficacy against gram positive bacteria (Strep species)
- significant gastrointestional adverse effects
- significant drug interactions - including ethanol

3. TETRACYCLINES

a). Adverse effects
1) Esophageal ulceration - take with 8 oz of liquid
2) Tooth staining - worst with tetracycline, best with doxycycline
- avoid below ages 8-10
3) Toxicity- outdated tetracycline (epimerization to renally toxic form)

b). Drug interactions

ALL TETRACYCLINES	*DOXYCYCLINE*	*TETRACYCLINE*
Antacids, bismuth	Phenobarbital	Food (milk, dairy)
Iron salts	Phenytoin	Cholestipol
Oral contraceptives		Zinc sulfate

c). Periodontal infections
Advantages in periodontal infections:
- high concentration in GCF
- good activity against A.A
- binds to root surfaces
- anticollagenase activity

1. INDIVIDUAL AGENTS

Clarithromycin (Biaxin) advantages over erythromycin base:

- PEDIATRIC DOSE: 15mg/kg/day
- 3% GI irritation as opposed to 30% for older agents, BID dosing, suspension available
- better activity against *S. pyogenes* than erythromycin, cefaclor or doxycycline
- better anaerobe coverage than erythromycin
- pregnancy C classification by FDA

Azithromycin (Zithromax): 2-4 fold less active than erythromycin against most strains of strep.

- pregnancy B classification by FDA

Erythromycin Base: ped dose 30-50mg/kg/day - not to exceed 2 grams/day
Erythromycin Ethylsuccinate: ped dose 40mg/kg/day - not to exceed 3.2 grams/day

2 ADVERSE EFFECTS

Cholestatic jaundice,
Gastrointestinal disturbances

3. DRUG INTERACTIONS

Alfentanil	Carbamazepine	Ergotamine
Anticoagulants	Cyclosporine	Terfenadine
Bromocriptine	Disopyramide	Theophylline

I. FLUOROQUINOLONES

- Not for use in pediatric patients (<18 years old) due to potential for arthropathy
- Sometimes used to manage chronic pseudomonal infections in cystic fibrosis patients

J. MISCELLANEOUS AGENTS

Miscellaneous Oral Agents

Drug	PED DOSAGE mg/kg/da	OK with food?	Usual adult regimen	activity against oral pathogens Gm+ Aerobes	Gm- Anaerobes	Gm+ Anaerobes
Clindamycin (Cleocin,g)	20-30	yes	150-300mg q6h	+	+	+
Metronidazole (Flagyl,g)	15-35	yes	250-500mg q8h	-	+	+
Tetracyclines (avoid if <8-10yr)						
Tetracycline HCL(Sumycin,g)	25-50	no	250-500mg q6h	-	+	+,-
Doxycycline (Vibramycin,g)	2-4	yes	100mg q12-q24h	-	+	+,-
Minocycline (Minocin,g)	4	yes	100mg q12h	-	+	+,-

1. CLINDAMYCIN

a) Adverse effects:

Gastrointestinal disturbances
Antibiotic-associated colitis (AAC) - previously known as pseudomembranous coliti

b) *Clostridia Difficile Induced Colitis (CDIC):*

- caused by overgrowth of Clostridia difficile - toxin
- potential adverse effect of all antimicrobial agents - especially ones that affect obligate anaerobes

c) Four requirements for CDIC:

1. Presence of Clostridia difficile in GI tract
2. Altered gastrointestinal flora
3. Presence of Toxin A and B
   - must have toxin receptors in gut - children lack receptors