Antibiotic Prescribing in ENT Conditions

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No financial relationships to disclose

Discuss responsible antibiotic use in ENT conditions

Review Antibiotic agents by classification, discuss routes of administration, pharmacokinetics, pharmacotherapeutics, adverse reactions and drug interactions.

Discuss common pathogens with recommended treatment

Discuss common ENT infections and appropriate antibiotic selection.

Patient Teaching in responsible antibiotic use

Antibiotic Prescribing in ENT Conditions

One fourth of all Americans seek medical care due to infectious diseases

Over 150 million courses of antibiotics are prescribed each year

Five most common symptoms include: cough, sore throat, fever, nasal congestion, and earache

ENT clinicians must be current in understanding responsibilities in prescribing antibiotics for ENT infections

Empiric versus Culture Directed

Identify infecting microorganism by obtaining a culture

Culture and sensitivity may take 48-72 hours may begin treatment with a broad spectrum antibiotic switch to culture directed therapy as appropriate

The location of infection is considered for therapy to be effective, adequate concentration of agent to infection site for the appropriate time period.

Increasing Antibiotic Resistance

Indiscriminate use of anti-bacterial agents has serious consequences

Unnecessary exposure of organisms to anti-bacterial agents encourages the emergence of resistive strains.

New resistant strains of bacteria have greater consequences

In spite of mounting data clinicians in the US continue to prescribe antibiotics 40-50% of the in acute respiratory infections

Responsible Prescribing

Anti-infective agents should be reserved for patients with infections caused by susceptible organisms.

Agents should be prescribed in high enough doses for appropriate periods of time

New anti-infective agents should be reserved for severely ill patients with serious infections that do not respond to conventional treatment agents.
**Anti-Infective Agents**

- Antibacterial agents
- Antivirals
- Anti-tubercular agents
- Antifungals

For the scope of this discussion we will focus on antibacterial agents.

**Penicillins**

<table>
<thead>
<tr>
<th>Natural Penicillins</th>
<th>Penicillinase-resistant Penicillins</th>
<th>Amino Penicillins</th>
<th>Extended Spectrum Penicillins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Penicillin G</td>
<td>Bacampicillin, Penicillin G potassium, Penicillin G Procaine, Penicillin G sodium, Penicillin V potassium</td>
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</tr>
<tr>
<td>Doxycyclin sodium</td>
<td>Clavulanic acid, Naclin sodium</td>
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<tr>
<td>Amoxicillin, Ampicillin, Amoxicillin-Oxacillin sodium</td>
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<td></td>
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<tr>
<td>Dicloxacillin sodium, Clavulanic acid, Naclin sodium</td>
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<td></td>
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<tr>
<td>Bacampicillin sodium</td>
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</table>

**Cephalosporins**

<table>
<thead>
<tr>
<th>First Generation</th>
<th>Second Generation</th>
<th>Third Generation</th>
<th>Fourth Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefadroxil, Cefazolin sodium</td>
<td>Cefaclor, Cefotaxim, Loracarbef, Cefprozil, Cefuroxime axetil, Cefuroxime sodium</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cefdinir, Cefditoren, Cefepirone sodium, Cefditoren, Cefuroxime sodium</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Cefepime hydrochloride</td>
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</tbody>
</table>

**Cefadroxil, Cefazolin sodium, Cefaclor, Cefotaxim, Cefuroxime axetil, Cefuroxime sodium**

**Focus on the Drugs**

**Penicillins**

<table>
<thead>
<tr>
<th>Route of Administration</th>
<th>Pharmacologic Therapeutics</th>
<th>Adverse Reactions</th>
<th>Drug Interactions</th>
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<tbody>
<tr>
<td>Oral, IM, IV</td>
<td>1st generation gram-positive, Staphylococcus aureus, Streptococci, Enterococci. 2nd generation: Cefotetan, Cefuroxime axetil. 3rd generation: Ceftriaxone, Ceftazidime. 4th generation: Cefepime</td>
<td>Confusion, Seizures, Bleeding, Nausea, Vomiting, Diarrhea, Hypersensitivity, Anaphylaxis, Cross sensitivity to penicillin</td>
<td>Alcohol intolerance, Headache, flushing, dizziness, nausea, vomiting, atoxically. within 30 min of ETOH ingestion</td>
</tr>
</tbody>
</table>
Macrolides

<table>
<thead>
<tr>
<th>Erythromycin</th>
<th>Azithromycin</th>
<th>Clarithromycin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Erythromycin estolate, Erythromycin ethylsuccinate, Erythromycin lactobionate, Erythromycin stearate</td>
<td>Zithromax, 2-pack</td>
<td>Biaxin, Biaxin XL</td>
</tr>
</tbody>
</table>

Fluoroquinolones

<table>
<thead>
<tr>
<th>Ciprofloxacin</th>
<th>Levofoxacin</th>
<th>Moxifloxacin hydrochloride</th>
<th>Norfloxacin</th>
<th>Ofloxacin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower respiratory tract infections, infectious diarrhea, skin, bone, and joint infections</td>
<td>Lower respiratory infections, skin infections, Urinary tract infections</td>
<td>Bacterial sinusitis, mild to moderate community acquired pneumonia</td>
<td>Urinary tract infections, prostatitis</td>
<td>Infections of middle ear and conjunctivitis</td>
</tr>
</tbody>
</table>

Clindamycin

- Derivative of Lincomycin
- High potential of toxicity
- Drug of choice with no therapeutic alternative

Macrolides

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<tbody>
<tr>
<td>Oral, IV</td>
<td>Erythramycin A, Group A Strep, Staph, S. aureus</td>
<td>GI distress, nausea, vomiting, rash, fever, eosinophilia, anaphylaxis</td>
<td>Inc. theophylline levels (toxicity): Clarithromycin May increase carbamazepine, DOC with H2 antagonists, antacids, and proton pump inhibitors in duodenal ulcer disease</td>
</tr>
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<tbody>
<tr>
<td>Oral, topical, IV</td>
<td>Ciprofloxacin</td>
<td>Dizziness, nausea vomiting, abdominal pain, ruptured tendons, tendinitis, fever, chills, blurred vision, tinnitus, photosensitivity</td>
<td>Decreased abs when admin with aluminum/magnesia containing antacids, cipro, norfloxacin &amp; ofloxacin may increase vancomycin abs, cipro or norfloxacin may decrease excretion of probenecid</td>
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Clindamycin

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<tr>
<td>Oral, IM, IV</td>
<td>Clindamycin</td>
<td>Diarrhea, stomatitis, nausea, vomiting, Hypersensitivity reactions</td>
<td>Has neuromuscular blocking properties may enhance action of neuromuscular blocking agents leading to profound respiratory depression</td>
</tr>
</tbody>
</table>

Clindamycin

- Potent against most aerobic gram -ve and anaerobic pathogens including staph, strep, and pneumococci
- Inhibits bacterial protein synthesis and may inhibit bacterial ribosomes.
**Tetracyclines**

**Intermediate Acting Compounds**
- Demeclocycline hydrochloride
- Tetracycline hydrochloride

**Long Acting Compounds**
- Demeclocycline hydrochloride
- Minocycline hydrochloride

**Pharmacology**
- Oral: Give 1 hour before or 2 hours after meals for maximum absorption. DO not give tetracycline with food, milk or other dairy products. Give water with oral admin to promote passage to stomach.

**Adverse Reactions**
- Increased metabolism and decreased antibiotic action with barbiturates, cimetidine, and phenytoin.

**Drug Interactions**
- Superinfections, nausea, vomiting, abd distress and dilatation, diarrhea, photosensitivity, hepatic toxicity, renal toxicity, discoloration of permanent teeth, enamel in fetus, and children, may impair fetal skeletal development in pregnancy.

**Reduced effectiveness of oral contraceptives; Reduced absorption with aluminum, calcium, and magnesium antacids. Reduced absorption with iron salts, bismuth subsalicylate, and zinc.**

**Sulfonamides**

**Trimethoprim and Sulfamethoxazole**
- Pneumocystis carinii pneumonia, acute otitis media due to H. influenzae and S. pneumoniae
- Pneumocystis carinii pneumonia, acute otitis media due to H. influenzae and S. pneumoniae
- Acute exacerbations of bronchitis

**Sulfadiazine**
- Serum sickness, fever, joint pain, hives, bronchospasm, leukopenia, photosensitivity; high doses may predispose to uric acid crystals
- Trichomonas and sulfonamides increase risk of kidney toxicity

**Drug Interactions**
- Increase hypoglycemic effects
- Sulfonylureas + decrease blood glucose levels; combination with metformin may lead to hypoglycemic effect
- May increase anticoagulant effect of coumarin anti-

**Aminoglycosides**
- Amikacin sulfate
- Gentamicin sulfate
- Kanamycin sulfate
- Neomycin sulfate
- Netilmicin sulfate
- Paromomycin sulfate
- Streptomycin sulfate
- Tobramycin sulfate
### Aminoglycosides

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<th>Drug Interaction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Typically parenteral</td>
<td>Gram negative bacilli</td>
<td>Ototoxicity,</td>
<td>Caution with neuromuscular blockers increase muscular relaxation and respiratory distress. Increased risk of renal toxicity with cyclosporine, amphotericin B. Acetyl.</td>
</tr>
<tr>
<td>Topical</td>
<td>Binds 30S subunit</td>
<td>Neurotoxicity,</td>
<td></td>
</tr>
<tr>
<td>Ointions for pre-op</td>
<td>Interrupts protein</td>
<td>Nausea, vomiting,</td>
<td></td>
</tr>
<tr>
<td>Shaved prep</td>
<td>synthesis</td>
<td>diarrhea</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poor gi absorptions</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Crosses placental barrier</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Does not cross</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>blood brain barrier</td>
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### Vancomycin

- Used to treat methicillin-resistant S. Aureus
- 85% of drug is excreted in urine unchanged
- Metabolism unknown

### Carbapenems

- Imipenem-cilastatin sodium-broader spectrum coverage used for serious nosocomial infections particularly gram negative and gram positive.
- Meropenem
- Ertapenem
- Doripenem

### Focus on Bugs and Appropriate Drugs

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<tr>
<td>Parenteral, IV</td>
<td>Inhibits bacterial cell-wall synthesis</td>
<td>Nausea, vomiting, diarrhea, hypertension, respiratory distress</td>
<td>Probenecid increases serum concentrations of both. Probenecid may increase meropenem and ertapenem to toxic levels. Imipenem/ cilastatin -aminoglycosides produce synergistic action</td>
</tr>
<tr>
<td></td>
<td>Gram+ ie Staphylococcus aureus, Enterobacter species, P. aeruginosa, anaerobic sp. inc.</td>
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<tr>
<td></td>
<td>B fragilis</td>
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**Streptococcus pneumoniae**

- Gram-positive coccus
- Colonizes in nasopharynx
- Most prevalent pathogen of upper respiratory tract
- Accounts 1/3 acute otitis media and acute sinusitis
- May causes persistent infections

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**Streptococcus pneumoniae**

- Amoxicillin – high dose
  - Peds 90mg/kg divided doses
  - Adult 3-4 Grams divided doses
- Amoxicillin/Clavulanate - Augmentin
- Alternate
- Erythromycin, Clarithromycin – Biaxin or Clindamycin
- Cefpodoxime- Vantin
- Levofloxacin or Moxifloxacin

**Hemophilus Influenza**

- Gram-negative bacillus
- Major cause otitis media. Sinusitis, uvulitis, epi(supra)glottitis, meningitis, facial cellulitis, facial cellulitis, and conjunctivitis
- Colonizes by various strains in the nasopharynx, adenoids or tonsils activates with viral infection
- Type B invasive disease meningitis epiglottis
- 50% sinusitis and otitis will resolve without antibiotics

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**Hemophilus Influenza**

- Cefpodoxime (Vantin)
- Cefdinir (Omnicef)
- Amoxicillin Clavulanate (Augmentin)
- Ceftriaxone (Rocephin)
- Quinolones (Levofoxacin, Moxifloxacin)
**Moraxella catarrhalis**

- Gram negative diplococcus
- Colonizes in nasopharynx in 50% children and some adults
- Less virulent than Hemophilus
- Activates in viral infection
- 80% will resolve without antibiotics

**Staphylococcus aureus**

- Gram-positive coccus
- Aerobic/anaerobic
- Colonizer of skin and nares
- Destructive toxic pathogen in surgical and traumatic wound incisions
- Co-pathogen in deep neck abscesses, chronic tonsillitis, sinusitis, otitis and membranous croup

**Staphylococcus aureus**

- MRSA Methicillin resistant
  - Vancomycin IV
  - Daptomycin IV
  - Linezolid oral/Tigecycline IV
  - TMP/SMX +/- rifampin oral
  - Minocycline or doxycycline

**Pseudomonas aeruginosa**

- Aerobic gram-negative bacillus
- Exists in any moist environment
- Frequent traumatic and surgical wounds
- Moist ear canals in otitis externa invades middle ear spaces in TM perforations
- Invades nose/sinus in intubated and immunocompromised patients and cystic fibrosis patients
- Cause of perichondritis in pierced ears
- Responsible agent in malignant/necrotizing otitis externa
**Pseudomonas aeruginosa**
- Aminoglycosides
  - Gentamycin, Tobramycin, Amikacin
- Penicillins
  - Ticarcillin/clavulanic piperacillin/tazobactam
- 3rd 4th generation Cephalosporins
- Ceftazidime, cefepime + aminoglycoside
- Beta Lactam agents
  - Imipenem, meropenem, aztreonam
- Polymixins - topical
- Quinolone
  - Ciprofloxacin, levofloxacin

**Anaerobic Infection**
- Infected wound produces odor
- No growth on culture stain when infection obvious
- Mixed morphology on gram stain
- Infection in wound subject to mucosal contamination

**Anaerobic Infection**
- Penicillin, amoxicillin – augmented if suspect beta lactamase (50%) cases
- Cephalosporin ceftoxitin, cefotetan, imipenem, meropenem
- Clindamycin rapidly eliminates odor. Meronidazole may be combined with any of above antibiotics.

**Focus on Common ENT Infections**

**Otitic Infections**
- Acute Otitis Media
- Acute Bullous Myringitis
- Chronic Otitis Media
- Mastoiditis
- Acute Otitis Externa
- Chronic Otitis Externa
- Necrotizing Malignant Otitis Externa

**Otitis media - microbiology**
- Streptococcus pneumoniae – 25%
- Hemophilus influenzae – 20-25%
- Moraxella catarrhals 10%
- Occasional Streptococcus pyogenes/aureus/viral
- Drug choices: 1st line Amoxicillin/
  Amox/Clav (Augmentin)
  Cefdinir (omniaf), cefuroxime
  (cefixim), Ceftriaxone (Rocephin)
- If pen allergic: erythromycin, clindamycin, sulfonamide, levofloxacin
Mastoiditis - microbiology

- Predominant pathogens: Strep pneumoniae, group A beta-hemolytic streptococci, Staph aureus, hemophilus, proteus and bacteriodes species also reported.
- Primary treatment choice: Vancomycin IV plus Ceftriaxone IV
- Alternate Levofloxacin IV, Avelox IV, or Clindamycin rifampin or ceftriaxone IV or Ampicillin/sulbactam (Unasyn) IV

Suppurative Otitis Media - microbiology

- Mix of aerobic and anaerobic pathogens: Pseudomonas aeruginosa, Staph aureus and epidermidis, proteus species, klebsiella, rare E coli, prevotella, porphyromonas. With cholesteatoma, typical anaerobic streptococci, and Bacteriodes fragilis.
- Primary treatment choice: Floxin otic, cipro HC alternatives: cortisporin, boric acid powder

Otitis Externa - microbiology

- Predominantly Staph aureus occasionally other Staph/ Strep species.
- Primary treatment choices: Cephalexin
- Alternate choice: Clindamycin, dicloxacillin

Rhinologic Infections

- Acute Rhino-sinusitis
- Acute orbital cellulitis
- Chronic Sinusitis
- Chronic Rhinitis Nasopharyngitis

Acute Rhinosinusitis - microbiology

- Hemophilus influenzae - 38%
- Streptococcus pneumoniae - 37%
- Other hemophilus species - 8%
- Strep pyogenes - 6%
- Moraxella catarrhalis - 5%
- Viruses are also predominate cause
- First line treatment: Amoxicillin/ Augmentin
- Alternate erythromycin plus Bactrim or doxycycline

Amoxicillin for Acute Rhinosinusitis

- A randomized controlled trial 166 adults.
- Among patients blinded with antibiotic treatment versus placebo/ supportive medications did not show reduced symptoms at day three of treatment
- Outcomes assessed by telephone triage @ days 3, 7, 10, and 28.
- More improvements were noted in the amoxicillin treated group at day 7.
Chronic Sinusitis - microbiology
- Staphylococcus aureus more prevalent
- Fungi - more in chronic but role may be over estimated
- Pseudomonas predominant in cystic fibrosis with polyposis and in chronic sinusitis with polyposis
- Otherwise same pathogens as acute
  - Streptococcus pneumoniae
  - Hemophilus influenzae
  - Moraxella catarrhalis

Treatment choices for Chronic Sinusitis
- First line treatment Augmentin – Alternate Metronidazole plus Cefuroxime or levofloxacin or ciprofloxacin
- If staph: Clindamycin or Augmentin plus metronidazole
- If pseudomonas ciprofloxin, flosin, levofloxacin plus metronidazole or IV Ceftazidime (Fortaz), Aminoglycoside.

Oropharyngeal Infections
- Pharyngitis acute
- Adenoiditis
- Tonsillitis
- Stomatitis/mucositis
- Vincent’s Angina
- Hand, foot and mouth disease
- Laryngitis-acute
- Laryngitis Chronic
- Epiglottis
- Tracheobronchitis

Chronic Rhinitis/Nasopharyngitis microbiology - nonsymptomatic carrier
- Hemophilus influenzae prevalent inhabitant of adenoids in children.
- Drug of choice if adenoidectomy not an option rifampin (Rifadin)
- Staph aureus may be cultured from one third of normal healthy individuals.
- Drug of choice: mupirocin ointment, rifampin plus first generation cephalosporin or clindamycin.

Tonsillitis - microbiology
- Group A beta-hemolytic streptococcus most important pathogen.
- Other agents; Staph aureus, Moraxella catarrhalis, Hemophilus influenza.
- Throat cultures show wide variability- surface may not predict the core
- Drugs of choice: Augmentin, cephalexin with metronidazole. Alternate Clindamycin, cefuroxime

Peritonsillar Abscess - microbiology
- Streptococcus alpha and beta hemolytic species
- Strep viridans
- Neisseria species
- Various anaerobes and gram negative bacteria
- Drug of choice: Clindamycin with alternate Augmentin, Unasyn, or cefuroxime plus metronidazole.
**Pharyngitis - microbiology**

- Bacterial -30%
  - Strep Group A Beta hemolytic
  - Group C Beta Hemolytic
  - Mycoplasma pneumoniae
  - Chlamydia
- Viral – 40%
- Other 30%
  Acute onset, rapid progression, extreme pain, drooling rule out acute epiglottitis

**Stomatitis-Mucositis**

- Auto-immune/allergic condition with ulcerations that become invaded by normal flora
- Primary Nystatin or clotrimazole with alternant fluconazole (dilucan) or itraconazole (sporonox).
- Topical treatment – magic mouthwash
  - Diphenhydramine 100ml
  - Desamethasone 0.5mg/5cc 20ml
  - Nystatin suspension 60 ml
  - Tetracycline (from capsule) 1500mg
  One teaspoon 6X/day swish and swallow.

**Vincent’s Angina- “trench mouth”**

*Acute Necrotizing Ulcerative Gingivostomatitis*

- Spirochetes; Treponema vincenti,fusiforms, and anaerobes.
- Treatment Drug of choice: Clindamycin.
- Alternant: Ampicillin/sulbactam(Unasyn) IV,amox/clav,cefotixin,or cefotetan IV or penicillin IV plus metronidazole.

**Hand, Foot and Mouth Disease**

- Type A Coxsackie virus
- Maculopapular lesions hands, soles of feet, cheeks, palate, tongue, tonsillar arches, and buccal mucosa.
- Spontaneous recovery after several day duration.
- Supportive therapy

**Laryngitis**

- Acute typically viral
- After several days may have secondary bacterial infection; Moraxella catarrhalis 50%, Hemophilus influenzae 15%, other pneumococcus,streptococcus,staphylococcus,mycoplasma, pertussis.
- Initial supportive care – viral. Alternant Azithromycin,Doxycycline, Levofloxacin or moxifloxacin

**Epiglottis – Supraglottic group**

- Predominantly Hemophilus influenzae type b
- In adults Strep pyogenes; rare Streptococcus pneumoniae, Staphylococcus aureus.
- Uvulitis- same pathology
- Primary drug of choice: Ceftriaxone Rocephin IV
- Alternant: Cefuroxime (Zinacef) Ampicillin/sulbactam (Unasyn) Levofloxacin or moxifloxacin IV

**Auto-immune/allergic condition with ulcerations that become invaded by normal flora**

- Primary Nystatin or clotrimazole with alternant fluconazole (dilucan) or itraconazole (sporonox).
- Topical treatment – magic mouthwash
  - Diphenhydramine 100ml
  - Desamethasone 0.5mg/5cc 20ml
  - Nystatin suspension 60 ml
  - Tetracycline (from capsule) 1500mg
  One teaspoon 6X/day swish and swallow.
**Tracheobronchitis**

- Acute typically viral should not continue greater than 2 weeks. M. catarrhalis, Mycoplasma pneumoniae, or Legionella.
- Pertussis possible.
- Primary drug of choice initial supportive Erythromycin, Azithromycin or Clarithromycin with or without sulfonamide(TMP/SMX).
- Doxycycline or Levofloxacin or Moxifloxacin

**Laryngotracheobronchitis - subacute group**

- Predominately viral Influenza A. Possible superinfection with Staph aureus, Streptococcus pyogenes, Hemophilus influenzae.
- Primary drug of choice: Cefuroxime (Zincacef) or Ceftriaxone (Rocephin) or cefotaxime
- Alternant: Ampicillin/subactam (Unasyn) of Levofloxacin or Moxifloxacin.

**Head and Neck Infections**

- Thyroiditis
- Necrotizing cellulitis/fascitis
- Parotitis and sialadenitis
- Dacrocystitis
- Skin infections
- Folliculitis/ Furunculosis
- Odontogenic infections
- Lyme disease
- Cervical lymphadenitis

**Thyroiditis/Necrotizing Cellulitis/Fascitis - microbiology**

- Staph aureus, Strep pyogenes, pneumoniae, streptococcal species, E coli, klebsiella various aerobes and anaerobes.
- Rare mycobacteria, actinomyces, salmonella, treponema.

- Drug Choices: Clindamycin IV may add Gentamycin, ceftazidime, imipenem, or meropenem
- Alternant: Ampicillin/subactam (Unasyn) IV plus metronidazole, and or gentamycin

**Parotitis and Sialadenitis**

- Most common viral mumps
- Least common cytomegalovirus
- Coxsackie and Epstein–Barr virus
- Bacterial infections typically coagulase positive Staph aureus; less common S. pneumoniae, E. coli, Hemophilus influenzae oral anaerobes.
- Drug of choice Augmentin oral or Unasyn IV
- Alternatives: Clindamycin po or IV; cephalaxin or cefazolin with or without metronidazole, cefoximine, or vancomycin + metronidazole.

**Dacrocystitis - microbiology**

- S. pneumoniae and Hemophilus influenze predominiate in children
- Staph epidermidis, Staph aureus and Strep pyogenes more likely in adults
- Drugs of choice: Augmentin po or Unasyn IV
- Alternates Cefuroxime, or respiratory quinolones in adults.
**Skin Infections - Impetigo**
- Predominantly Strep pyogenes, Staph aureus
- Drug of choice: Mupirocin ointment plus 1st generation cephalosporin cephalexin
- Alternant: Mupirocin plus amox/clav or dicloxacillin, cefuroxime, clindamycin, or levofloxacin.

**Skin Infections: Folliculitis/Furunculosis/Carbuncles**
- Staph aureus, Pseudomonas aeruginosa
- Drug of choice: Mupirocin ointment plus 1st generation cephalosporin cephalexin
- Alternant: Mupirocin plus amox/clav or dicloxacillin, cefuroxime, clindamycin, or levofloxacin.
- If pseudomonas ciprofloxacin.

**Skin Infections - Erysipelas**
- Strep pyogenes, strep pneumoniae, Hemophilus influenzae, Staph aureus
- Primary drug of choice: amox/clav (Augmentin) or Ampicillin/sulbactam (Unasyn)
- Alternate: cefuroxime Ceftin oral of Zinacef IV
- Levofloxacin or Moxifloxacin or Vancomycin IV plus ceftriaxone IV

**Cellulitis**
- Adults: Strep pyogenes, or rare Staph aureus
- Children: Hemophilus influenzae, Strep pneumoniae
- Primary drug of choice: amox/clav (Augmentin) or Ampicillin/sulbactam (Unasyn)
- Alternate: cefuroxime Ceftin oral of Zinacef IV
- Levofloxacin or Moxifloxacin or Vancomycin IV plus ceftriaxone IV

**Odontogenic Infections**
- Anaerobes predominate over aerobes. Streptococcus, peptostreptococcus, bacteroides, porphyromonas, prevotella, fusobacterium, actinomycyes, veillonella, as well as anaerobic spirochetes. Beta lactam production by fusobacterium and prevotella is common.
- Primary drug of choice. Clindamycin IV Alternate: Ampicillin/sulbactam (Unasyn) IV or Amox/clav , Cefoxitin IV or cefotetan IV or penicillin plus metronidazole.

**Lyme Disease**
- Tick borne spirochete Borrelia burgdorferi.
- Primary Doxycycline 100mg BID 21-28 days
- Alternate: Amoxicillin 500mg qid 21-28days
- Erythromycin 250 mg qid 21-28days
- Cefuroxime 500 mg bid 21-28 days
- Clarithromycin 500mg bid 21-28 days
- With neurological symptoms Ceftriaxone IV 2 GM/ day 21-28 days
Lymphadenitis - microbiology

Acute suppurative

- Represent entire spectrum of head and neck infections along with systemic infections
- Strep pyogenes impetigo / tonsillopharyngitis
- Staph aureus – skin infections- these two account for 50-80% of cases
- Peptococcus, Peptostreptococcus, Fusobacterium bacteroides – odontogenic infections
- Corynebacterium diphtheria

Subacute/Chronic Lymphadenitis

- Viruses: Parainfluenza, Adenoviruses, Enteroviruses,
- Herpes simplex, human herpes, Epstein-Barr, Cytomegalovirus
- Bartonella (cat scratch fever) 1st line Doxycycline or macrolide
- Toxoplasmosis
- Chronic Suppurative- Atypical Mycobacterium tuberculosis

Patient Teaching/ Antibiotic Prescribing

- Take medication as prescribed, take entire course, and follow food instructions
- Report any unusual reactions
- If taking hormonal contraception, use additional form contraception during drug therapy.
- Do not discontinue upon symptom relief.
- Do not start a previous prescription or take someone’s medication.
- Follow expiration dates.
- Store medication properly.
- Consider High dose shorter course of treatment