

ANTIBACTERIAL THERAPY

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Specific antibiotic therapy is optimally driven by a ***microbiologic diagnosis***, predicated on isolation of the pathogenic organism from a sterile body site, and supported by clinical diagnosis .

empirical use of antibacterial agents, administered before or even without eventual identification of the specific pathogen.

the age-appropriate differential diagnosis with respect to likely pathogens.

the child's immunologic status

antimicrobial resistance

vaccination

History of The presence of foreign bodies

Classification of antibacterial agents

Bactericidal

β -lactam agents

Aminoglycosides

Co-trimoxazole

Vancomycin

Bacteriostatic

Erythromycin

Tetracyclines

Chloramphenicol

Sulfonamides

PROTECTED ANTIBIOTICS IN PAEDIATRICS

Antibacterial drug classification	Antibacterial drug	Comment
Beta-lactam antibiotics	Meropenem Ertapenem Piperacillin / Tazobactam	
Aminoglycosides	Tobramycin injection Tobramycin nebulas	For paediatric patients with cystic fibrosis only
Macrolides	Azithromycin syrup and capsules	Can be used for paediatrics third line where compliance is an issue

Quinolones	<p>Ciprofloxacin tablets, suspension and infusion</p> <p>Levofloxacin tablets and injection</p>	For CF patients
Other antibiotics	<p>Chloramphenicol injection</p> <p>Colistin injection for nebulised use</p> <p>Co-trimoxazole</p> <p>Fosfomycin inj</p> <p>Daptomycin Inj Linezolid injection, tablets and suspension</p>	<p>For use in penicillin allergic patients only in CNS infections</p> <p>For CF patients only</p> <p>For use in feverish illness in children for children > 3 months in penicillin allergy (IV), in intra-abdominal sepsis and post-operative intra-abdominal infections in penicillin allergy (PO),</p> <p>For use in CNS infections in penicillin allergic patients</p>



Antibiotics: Penicillins

Natural penicillins

- penicillin G, penicillin V potassium

Penicillinase-resistant penicillins

- cloxacillin, dicloxacillin, methicillin, nafcillin, oxacillin

Penicillins: Mechanism of Action

- Penicillins enter the bacteria via the cell wall.
- Inside the cell, they bind to penicillin-binding protein.
- Once bound, normal cell wall synthesis is disrupted.
- Result: **bacteria cells die from cell lysis.**
- Penicillins do not kill other cells in the body.

Antibiotics: Penicillins

- Bacteria produce enzymes capable of destroying penicillins.
- These enzymes are known as **beta-lactamases**.
- As a result, the medication is not effective.

Antibiotics: Penicillins

- Chemicals have been developed to inhibit these enzymes:
 - clavulanic acid
 - tazobactam
 - sulbactam
- These chemicals bind with beta-lactamase and prevent the enzyme from breaking down the penicillin

Antibiotics: Penicillins

Aminopenicillins

- amoxicillin, ampicillin, bacampicillin

Extended-spectrum penicillins

- piperacillin, ticarcillin, carbenicillin, mezlocillin

Penicillins: Therapeutic Uses

- Prevention and treatment of infections caused by susceptible bacteria, such as:
 - gram-positive bacteria
 - Streptococcus, Enterococcus, Staphylococcus species

PENICILLINS

the drugs of choice :

group A and group B Streptococcus, Treponema pallidum (syphilis), L. monocytogenes, and N. meningitides

The semisynthetic penicillins (nafcillin, cloxacillin, dicloxacillin) susceptible staphylococcal infections, although the increasing incidence of MRSA has limited the usefulness of these drugs.

aminopenicillins (ampicillin, amoxicillin)

broad-spectrum activity against *Gram-negative organisms*, including *E. coli* and *H. influenzae*, but the emergence of resistance has limited their utility in many clinical settings.

The carboxypenicillins (carbenicillin, ticarcillin) and ureidopenicillins (piperacillin, mezlocillin, azlocillin) also have bactericidal activity against most strains of *P. aeruginosa*.

Antibiotics: Cephalosporins

- First Generation
- Second Generation
- Third Generation
- Fourth Generation

Antibiotics: Cephalosporins

- Semisynthetic derivatives from a fungus
- Structurally and pharmacologically related to penicillins
- Bactericidal action
- Broad spectrum
- Divided into groups according to their antimicrobial activity

Cephalosporins: First Generation

cefazolin

(Ancef and Kefzol)

IV and PO

cephalexin

(Keflex and Keftab)

PO

used for surgical prophylaxis, URIs, otitis media

Cephalosporins: First Generation

- cefadroxil
- cephalexin
- cephradine
- cefazolin
- cephalothin
- cephapirin
 - Good gram-positive coverage
 - Poor gram-negative coverage

Cephalosporins: Second Generation

- cefaclor
 - cefprozil
 - cefamandole
 - cefoxitin
 - cefuroxime
 - cefonicid
 - ceforanide
 - cefmetazole
 - cefotetan
- Good gram-positive coverage
 - Better gram-negative coverage than first generation

Cephalosporins: Second Generation

Cefoxitin

(Mefoxin)

IV and IM

Used prophylactically for abdominal or colorectal surgeries
Also kills anaerobes

cefuroxime

(Kefurox and Ceftriaxone)

PO

Surgical prophylaxis
Does not kill anaerobes

Cephalosporins: Third Generation

cefixime (Suprax)

- Only oral third-generation agent
- Best of available oral cephalosporins against gram-negative
- Tablet and suspension

ceftriaxone (Rocephin)

- IV and IM, long half-life, once-a-day dosing
- Easily passes meninges and diffused into CSF to treat CNS infections

Cephalosporins: Fourth Generation

cefepime (Maxipime)

- Newest cephalosporin agents.
- Broader spectrum of antibacterial activity than third generation, especially against gram-positive bacteria.

Table 180-5

Classification of Parenteral and Oral Cephalosporins

CEPHALOSPORINS	FIRST GENERATION	SECOND GENERATION	CEPHAMYCINS	THIRD GENERATION	FOURTH GENERATION	FIFTH GENERATION
Parenteral	Cefazolin (Ancef, Kefzol)	Cefamandole (Mandol)	Cefmetazole (Zefazone)	Cefoperazone (Cefobid)	Cefepime (Maxipime)	Ceftaroline (Teflaro)
	Cephalothin (Keflin, Seffin)	Cefonicid (Monocid)	Cefotetan (Cefotan)	Cefotaxime (Claforan)	Cefpirome (Cefrom)	Ceftobiprole (Zeftera)
	Cephapirin (Cefadyl)	Cefuroxime (Kefurox, Zinacef)	Cefoxitin (Mefoxin)	Ceftazidime (Fortaz)	Ceftolozane (combined with tazobactam; CXA-101)	
	Cephradine (Velosef)			Ceftizoxime (Cefizox)		
				Ceftriaxone (Rocephin)		
Oral	Cefadroxil (Duricef, Ultracef)	Cefaclor (Ceclor)		Cefdinir (Omnicef)		
	Cephalexin (Keflex, Biocef, Keftab)	Cefprozil (Cefzil)		Cefditoren (Spectracef)		
		Cefuroxime-axetil (Ceftin)		Cefixime (Suprax)		
	Cephradine (Velosef)	Loracarbef (Lorabid)		Cefpodoxime (Vantin)		
				Ceftibuten (Cedax)		

Adapted from Mandell GL, Bennett JE, Dolin R, editors: Principles and practice of infectious diseases, ed 7. Philadelphia, 2010, Elsevier, Table 22-1.

CEPHALOSPORINS

*The first-generation cephalosporins (e.g., **cefazolin**, a parenteral formulation, and **cephalexin**, an oral equivalent) are commonly used for management of skin and soft-tissue infections caused by **susceptible strains of S. aureus and group A Streptococcus.***

The second-generation :

*cephalosporins (e.g., **cefuroxime, cefoxitin**)*

*are used to treat **respiratory tract infections, urinary tract infections, and skin and soft-tissue infection***

sinopulmonary infections and otitis media

CARBAPENEMS

Gram-positive, Gram-negative, and anaerobic organisms.

MRSA and E. faecium are not susceptible to carbapenems.

poorly active against Stenotrophomonas maltophilia

GLYCOPEPTIDES

vancomycin bactericidal and act via inhibition of cell wall biosynthesis

Gram-positive organisms, including *S. aureus*,
coagulase-negative staphylococci,
pneumococcus, enterococci, *Bacillus*, and
Corynebacterium

value for serious infections, including meningitis, caused by fever and neutropenia in oncology patients, MRSA and penicillin- and cephalosporin-resistant S. pneumoniae

infections associated with indwelling medical devices

Clostridium difficile infections

Telavancin has been approved by FDA for the treatment of ***skin and soft-tissue infections*** by ***MRSA*** for situations where other alternatives are not suitable.

Antibiotics: Aminoglycosides

- gentamicin (Garamycin)
- kanamycin
- neomycin
- streptomycin
- tobramycin
- amikacin (Amikin)
- netilmicin

Aminoglycosides

- Natural and semi-synthetic
- Produced from Streptomyces
- Poor oral absorption; no PO forms
- Very potent antibiotics with serious toxicity
- Bactericidal
- Kill mostly gram-negative; some gram-positive also

Aminoglycosides

- Used to kill gram-negative bacteria such as *Pseudomonas* spp., *E. coli*, *Proteus* spp., *Klebsiella* spp., *Serratia* spp.
- Often used in combination with other antibiotics for synergistic effect.

Aminoglycosides

- Three most common (systemic): gentamicin, tobramycin, amikacin
- Cause serious toxicities:
 - Nephrotoxicity (renal failure)
 - Ototoxicity (auditory impairment and vestibular [eighth cranial nerve])
- Must monitor drug levels to prevent toxicity

Aminoglycosides: Side Effects

Ototoxicity and nephrotoxicity are the most significant

- Headache
- Paresthesia
- Neuromuscular blockade
- Dizziness
- Vertigo
- Skin rash
- Fever
- Superinfections

AMINOGLYCOSIDES

mechanism of action via inhibition of bacterial protein synthesis

Gram-negative infections ,broad-spectrum agents: activity against

S. aureus and provide synergistic activity against **group B**

streptococcus, L. monocytogenes, viridans streptococci,

corynebacteria, Pseudomonas, Staphylococcus epidermidis, and

Enterococcus when coadministered with a β -lactam agent.

neonatal sepsis, urinary tract infections, Gram negative sepsis, and complicated intraabdominal infections; infections in cystic fibrosis patients (including both parenteral and aerosolized forms of therapy); and in oncology patients with fever and neutropenia.

Aminoglycosides, in particular streptomycin, are also important in the management of Francisella tularensis, Mycobacterium tuberculosis, and atypical mycobacterial infections.

Antibiotics: Quinolones

- ciprofloxacin (Cipro)
- enoxacin (Penetrex)
- lomefloxacin (Maxaquin)
- norfloxacin (Noroxin)
- ofloxacin (Floxin)

Quinolones

- Excellent oral absorption
- Absorption reduced by antacids
- First oral antibiotics effective against gram-negative bacteria

Quinolones: Mechanism of Action

- Bactericidal
- Effective against gram-negative organisms and some gram-positive organisms
- Alter DNA of bacteria, causing death
- Do not affect human DNA

Quinolones: Therapeutic Uses

- Lower respiratory tract infections
- Bone and joint infections
- Infectious diarrhea
- Urinary tract infections
- Skin infections
- Sexually transmitted diseases

Quinolones: Side Effects

Body System

Effects

CNS

headache, dizziness, fatigue, depression, restlessness

GI

nausea, vomiting, diarrhea, constipation, thrush, increased liver function tests

TETRACYCLINES

bacteriostatic antibiotics that exhibit their antimicrobial effect by binding to the bacterial 30S ribosomal subunit, inhibiting protein translation.

broad spectrum of antimicrobial activity against Gram-positive and Gram-negative bacteria, rickettsia, and some parasites.

Rocky Mountain spotted fever, ehrlichiosis, Lyme disease, and malaria.

TIGECYCLINE

SEMISYNTHETIC DERIVATIVE OF MINOCYCLINE

*Tigecycline is active against tetracycline-resistant
Gram-positive and Gram-negative pathogens,
including **MRSA**, and possibly **VRE**, but not
Pseudomonas.*

SULFONAMIDES

trimethoprim-sulfamethoxazole (TMP-SMZ),

*Commonly used for treatment of **urinary tract infections.***

*. TMP-SMZ also plays a unique role in **immunocompromised patients, as a prophylactic and therapeutic agent for Pneumocystis jiroveci infection.***

*Other commonly used sulfonamides include **sulfisoxazole,** which is useful in the management of **urinary tract infections,** **sulfadiazine,** which is a drug of choice in the treatment of **toxoplasmosis.***

MACROLIDES

*The spectrum of antibiotic activity includes many **Gram-positive bacteria.***

*resistance to these agents among *S. aureus* and group A *Streptococcus* is fairly widespread, limiting the usefulness of macrolides for many skin and soft-tissue infections and for streptococcal pharyngitis.*

Azithromycin and clarithromycin have demonstrated efficacy for otitis Media

All of the members of this class have an important role in the management of **pediatric respiratory infections**, including **atypical pneumonia** caused by *M. pneumoniae*, *Chlamydia pneumoniae*, and *Legionella pneumophila*, as well as infections caused by *Bordetella pertussis*.

Crossresistance may develop between a macrolide and the subsequent use of clindamycin.

LINCOSAMIDES(CLINDAMYCIN)

Protein synthesis inhibitor

*active against most **Gram positive aerobic and anaerobic cocci***

except

Enterococcus

*therapy of serious infections caused by **MRSA**.*

*Clindamycin is also useful in the management of **invasive group A Streptococcus infections** and in the management of many **anaerobic infections**,*

Clindamycin also plays an important role in the treatment of **malaria and babesiosis** (when coadministered with quinine), ***P. jiroveci* pneumonia** (when coadministered with primaquine), and **toxoplasmosis**.

DALFOPRISTIN-QUINUPRISTIN

MRSA,

coagulase negative staphylococci,

penicillin-susceptible and penicillin-resistant

S. pneumoniae,

and vancomycin-resistant E. faecium

but not E. faecalis.

LINEZOLID

MRSA,

VRE,

coagulase-negative staphylococci,

penicillin-resistant S. pneumoniae.

DAPTOMYCIN

*all Gram-positive organisms, including E. faecalis and E. faecium
(including **VRE**) and
S.aureus (including **MRSA**)*

***Daptomycin is inactivated by surfactant and should not be used
to treat pneumonia.***

METRONIDAZOLE

*a unique role as an **antianaerobic** agent and also possesses **antiparasitic** and **anthelmintic** activity.*

RIFAMPIN

*major role in the manage of **tubercuiosis**
usually used as a second (synergistic) agent in the
treatment of **S. aureus** infections or to eliminate
nasopharyngeal colonization of **H. influenzae** type b or
N. meningitidis.*

Rifaximin is a nonabsorbed rifamycin that has been used as an adjunct agent to treat patients with multiple recurrences of **C. difficile** infection.

COLISTIN
THIS AGENT IS A MEMBER OF
THE POLYMYXIN FAMILY OF ANTIBIOTICS (POLYMYXIN E).

Colistin is broadly active against the •

Enterobacteriaceae family, including *P. aeruginosa*. It is also •
active against extended-spectrum β -lactamase– and
carbapenemase producing strain



FEVERISH ILLNESS IN CHILDREN

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
Feverish Illness in children¹ Children < 3 months	IV Cefotaxime + IV Amoxicillin		Give parenteral antibiotics to: - infants younger than 1 month with fever - all infants aged 1-3 months with fever who appear unwell - infants aged 1-3 months with WBC < 5 or > 15 x 10 ⁹ /L - Amoxicillin added to cover for Listeria
Children > 3 months	IV Ceftriaxone	If history of immediate hypersensitivity to penicillin or cephalosporin IV Co-trimoxazole	Give immediate parenteral antibiotics to children with fever if they are: - shocked - unrousable /showing signs of meningococcal disease

GASTROINTESTINAL INFECTIONS

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>Diarrhoea and Vomiting</p> <p>Likely to be viral</p> <p>Adenovirus Enterovirus Rotavirus Noravirus (SRSV – small round structured virus)</p>	<p>Antibiotics are not indicated</p>		<p>Likely viral</p> <p>Faecal adenovirus can cause nasal symptoms as well as diarrhoea</p> <p>Send faecal specimen</p> <p>No need unless septicaemic, blood/mucus in stool or immunocompromised</p>
<p>Campylobacter / Salmonella / Shigella enteritis</p>	<p>Must be based on culture results</p> <p>Usually self-limiting</p>		<p>Treat Campylobacter symptomatically, only consider antibiotics if immunocompromised or severe disease.</p>
<p>E coli 0157</p>	<p>Conservative management : antibiotic therapy is not recommended</p>		

Cryptosporodium	Self-limiting, treatment not recommended		If symptoms are repetitive or persistent contact consultant microbiologist for advice
Intra-abdominal sepsis and post- operative intra- abdominal infections (eg gangrenous appendix)	IV Amoxicillin + IV Metronidazole Oral step down PO Co-amoxiclav	IV Vancomycin + IV Aztreonam + IV Metronidazole Oral step down PO co-trimoxazole + Metronidazole	
	Total Duration 5 days		

coliforms
enterococcus
anaerobes

<p>Wounds at gastrostomy sites</p> <p>Staphylococci</p> <p>Streptococci</p>	<p>PO Flucloxacillin</p>	<p>PO Clindamycin</p>	
<p>Perianal abscess</p> <p>Staphylococci</p> <p>Group A strep</p> <p>Anaerobes</p>	<p>IV Co-amoxiclav</p> <p>Post drainage up to 2 weeks</p>	<p>IV Clindamycin</p> <p>Post drainage up to 2 weeks</p>	<p>Switch to oral at clinical discretion. Aim for minimum of 5 days IV</p>

RESPIRATORY TRACT INFECTIONS

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>Acute Otitis Media ¹ 23</p> <p>Usually viral</p> <p><i>S. pneumoniae</i>, <i>H. influenzae</i>, <i>M. catarrhalis</i>.</p>	<p>Non- severe: PO Amoxicillin</p> <p>Severe: IV Cefuroxime or IV Co-amoxiclav or high dose IV Amoxicillin</p>	<p>Non- severe: PO Erythromycin or PO Clarithromycin</p> <p>Severe: IV Ceftriaxone or IV Clarithromycin</p>	<p>Most uncomplicated cases resolve without antibiotics. Manage pain and fever.</p> <p>Antibiotics indicated if:</p> <ul style="list-style-type: none"> - <6 months of age - Bilateral and <2years of age - Unilateral with otorrhoea - Evidence of mastoiditis - Severe or no improvement after 48-72 hours - At risk of complications (e.g. immunosuppression, CF)
	<p>Duration Non-severe and >5years: 5 days Severe or < 5years: 10 days</p>		

<p>Mastoiditis Staph. aureus S. pneumoniae H. influenzae</p>	<p>IV Co-amoxiclav</p> <p>Severe: IV Ceftriaxone</p> <p>Duration: As clinically deemed appropriate (will also depend on whether there is a mastoid abscess)</p>	<p>IV Clindamycin and IV Aztreonam</p>	<p>Switch to narrow spectrum agent based on cultures</p>
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Acute Sinusitis ⁴

Likely viral.

S. pneumoniae,
H. influenzae,
M. catarrhalis

Non- severe:
PO Co-amoxiclav

Severe:
High dose IV
Amoxicillin or IV
Ceftriaxone

Non- severe:
PO Erythromycin
or PO
Clarithromycin

Severe:
IV Clarithromycin

Likely viral and do not require antibiotics.

Consider antibiotics if:

- Persistent or worsening symptoms (e.g. purulent nasal discharge, daytime cough, fever) for >7-10days
- Severe
- High risk for complications (e.g. immunosuppression, CF)

Duration:
Non-severe: 7days
Severe: 10-14 days

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>Tonsillitis ¹⁵⁶</p> <p>Usually viral</p> <p><i>Group A beta-haemolytic Strep</i></p>	<p>Non- severe: PO Phenoxymethypenicillin (Penicillin V)</p> <p>Severe: IV Benzylpenicillin</p> <p>Duration Non- severe: 10 days Severe: 10 days</p>	<p>Non- severe: PO Erythromycin or PO Clarithromycin</p> <p>Severe: IV Clindamycin</p>	<p>Most sore throats are viral.</p> <p>Consider antibiotic treatment if 3 out of 4 Centor criteria:</p> <ol style="list-style-type: none"> 1) Tonsillar exudate 2) Tender anterior cervical lymph nodes 3) history of fever 4) absence of cough <p>Or</p> <p>If features of systemic upset, peritonsillar cellulitis or abscess, at increased risk from acute infection (e.g. immunocompromised, CF) or history of valvular heart disease.</p> <p>SEND THROAT SWAB</p> <p>Do not use amoxicillin or co-amoxiclav in case patient has infectious mononucleosis as causes rash.</p>

<p>Peritonsillar/ Retropharyngeal abscess</p>	<p>Initially treat with IV antibiotics</p>	<p>Initially treat with IV antibiotics</p>	<p>Drainage is essential part of treatment.</p> <p>Send pus for MC&S.</p>
<p>Anaerobes Group A strep <i>S. aureus</i></p>	<p>IV Co-amoxiclav then PO</p>	<p>IV Clindamycin initially then PO</p>	
<p>+/- coliforms</p>	<p>Duration: depends on clinical outcome and culture sensitivities</p>		

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>Acute Epiglottitis</p> <p><i>H. influenzae</i></p>	<p>Initially treat with IV antibiotics</p> <p>IV Ceftriaxone</p> <p>Duration: 10-14 days</p>	<p>Initially treat with IV antibiotics</p> <p>IV Aztreonam</p>	<p><i>Secure airway first and call anaesthetist</i></p> <p><i>Avoid upsetting child.</i></p>
<p>Pertussis</p>	<p>Non-severe: PO Clarithromycin or PO Erythromycin</p> <p>Severe: IV Clarithromycin</p> <p>Duration: 7 days</p>		<p>Ensure vaccination history obtained</p> <p>Inform PHE and obtain further guidance on vaccination</p>

Tracheitis with secondary bacterial infection	High dose IV Amoxicillin	IV Clarithromycin	Ensure airway secure and avoid upsetting child.
Mainly caused by respiratory viruses.	Duration: 5-7 days		If not responding to initial treatment after 72hours send sputum for MC&S and start antibiotics.
Cervical lymphadenitis Mixed bacteria, including anaerobes. Can be caused by mycobacterial species.	Initially treat with IV antibiotics IV Co-amoxiclav then PO (if child well PO initially)	Initially treat with IV antibiotics IV Clarithromycin then PO Erythromycin or PO Clarithromycin (if child well PO initially)	For chronic cases discuss with consultant microbiologist whether to send serology tests. Consider atypical mycobacterial/ TB infection.
	Duration: 7-10 days		Consider referral to ENT

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>Bronchiolitis with secondary bacterial infection</p> <p>Viral, RSV.</p>	<p>Non-severe: PO Amoxicillin</p> <p>Severe: IV Cefotaxime</p>	<p>Non- severe: PO Erythromycin or PO Clarithromycin</p> <p>Severe: IV Clindamycin</p>	<p>Do not routinely prescribe antibiotics but consider if <6 weeks old or temp >39C</p> <p>If <6 months of age treat as severe (see next page).</p> <p>Difficult to distinguish viral from bacterial pneumonia, therefore if there is a clear clinical</p>
	<p>Duration: 5-7 days</p>		

<p>Uncomplicated Community Acquired Pneumonia ^{7 8}</p> <p>RSV, respiratory viruses, Strep pneumoniae, H. influenza, S. aureus</p> <p>In school age also atypicals (M. pneumonia, Chlamydia)</p>	<p>≤ 5 years: PO Amoxicillin. Add macrolide if no response.</p> <p>5-18 years: PO Amoxicillin + PO Erythromycin or PO Clarithromycin if Mycoplasma or other atypicals likely or if no response</p> <p>If S.aureus suspected (e.g. bullae on CXR) add Flucloxacillin or Clindamycin</p> <p>In pneumonia associated with influenza use Co-amoxiclav</p>	<p>≤ 5 years: PO Erythromycin or PO Clarithromycin</p> <p>5-18 years: PO Erythromycin or PO Clarithromycin</p>	<p>diagnosis of pneumonia treat with antibiotics</p> <p>If <2years presenting with mild symptoms of lower respiratory tract infection, pneumonia unlikely, so antibiotics unlikely to be needed especially if had pneumococcal vaccine.. Review if persists.</p> <p>Consider obtaining blood cultures in suspected pneumonia.</p> <p>Mycoplasma suggested by:</p> <ul style="list-style-type: none"> - Age >5 years - Subacute onset - Prominent cough - +/- headache - +/- sore throat
	<p>Duration: 7-10 days 14 days for S. aureus 2-3 weeks for mycoplasma, chlamydia</p>		

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>Severe CAP ^{7 8}</p> <p>RSV, respiratory viruses, Strep pneumoniae, <i>H. influenza</i>, <i>S. aureus</i></p> <p>In school age also atypicals (<i>M. pneumonia</i>, Chlamydia)</p>	<p>IV Cefotaxime + IV Clarithromycin</p> <p>If <i>S. aureus</i> suspected (e.g. bullae on CXR) add Flucloxacillin or Clindamycin (stop Clarithromycin)</p>	<p>IV Clarithromycin + IV Vancomycin</p> <p>If <i>S. aureus</i> suspected (e.g. bullae on CXR) add Clindamycin (stop Clarithromycin)</p>	<p>Obtain blood cultures and send sputum for MC&S if able to obtain.</p> <p>If child remains unwell or feverish after 48hrs treatment re-evaluate:</p> <ul style="list-style-type: none"> - Is the patient having appropriate treatment at adequate dose? - Is there a lung complication such as a collection of pleural fluid with development of an empyema or evidence of a lung abscess? - Is the patient not responding because of a complication such as immunosuppression or co-existent disease such as CF?
	<p>Duration: 2-3 weeks</p>		

<p>Hospital acquired pneumonia⁹</p> <p>RSV, respiratory viruses, Strep pneumoniae. <i>H. influenza</i>, <i>S. aureus</i></p> <p>In school age also atypicals (<i>M. pneumonia</i>, Chlamydia)</p> <p>Tendency towards more resistant organisms such as Enterobacteriaceae and Pseudomonas aeruginosa.</p>	<p>IV Ceftazidime</p> <p>Consider adding IV Gentamicin for severe Pseudomonas infection.</p>	<p>IV Vancomycin + IV Aztreonam</p>	<p>Treat as Community Acquired Pneumonia if onset <5 days after admission to hospital and no recent history of antibiotic treatment.</p> <p>Consider treating those with chronic illness such as severe neuro disability or frequent hospital admissions as HAP.</p>
<p>Duration: 7-10 days 2 weeks for <i>S. aureus</i>/MRSA 2-3 weeks for Pseudomonas</p>			

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>Empyema ^{8 10}</p> <p><i>S. aureus</i>, <i>S. pneumoniae</i>, <i>H. influenzae</i>, <i>S. pyogenes</i> +/- coliforms, +/- anaerobes</p>	<p>Acute, community acquired usually parapneumonic: IV Amoxicillin + IV Clindamycin</p> <p>Sub-acute/ chronic, or Hospital acquired: If < 3months IV Cefotaxime</p> <p>If > 3months: IV Ceftriaxone</p> <p>If MRSA is suspected add IV Vancomycin to the above combinations</p> <p>Duration: 2-4 weeks</p>	<p>Acute, community acquired usually parapneumonic: IV Aztreonam + IV Clindamycin</p> <p>Sub-acute/ chronic, or Hospital acquired: IV Aztreonam + IV Clindamycin</p>	<p>Advise US chest.</p> <p>Consider discussion with Respiratory physician in immunocompromised, hospital acquired or TB suspected.</p> <p>Send sample of pleural fluid for MC&S (+/- PCR and AAFB if TB suspected) and biochemistry.</p> <p>Send blood cultures and sputum.</p> <p>Consider need for chest drain especially if effusion enlarging or respiratory compromise. Reduces duration of illness/ length of hospital stay compared to abx use alone.</p> <p>Broader cover required if hospital acquired or secondary to trauma, surgery or aspiration.</p>

For all ages:

If recent multiple antibiotics exposure or overseas travel

Consider adding IV Vancomycin

If signs/symptoms suggestive of herpes simplex encephalitis

Add IV Aciclovir

At discretion of Consultant

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>For confirmed disease: Children < 3 months Neisseria meningitidis</p> <p>Group B streptococci</p> <p>Listeria monocytogenes</p> <p>Gram negative bacilli</p>	<p>IV Cefotaxime for 7 days in total</p> <p>IV Cefotaxime for at least 14 days</p> <p>IV Amoxicillin for 21 days + IV Gentamicin for 1st 7 days</p> <p>IV Cefotaxime for at least 21 days</p>		<p>Perform lumbar puncture on 20th day of 3 week course, before decision is made to stop treatment</p>

			Stop treatment
<p>For unconfirmed disease: Children < 3 months</p>	<p>IV Cefotaxime + IV Amoxicillin for at least 14 days</p>		<p>Failed lumbar puncture or negative blood/CSF culture and/or blood/CSF PCR</p>
<p>For confirmed disease: Children > 3 months Neisseria meningitidis</p> <p>Strep pneumoniae</p> <p>H. influenzae type b</p>	<p>IV Ceftriaxone for 7 days in total</p> <p>IV Ceftriaxone for 14 days</p> <p>IV Ceftriaxone for 10 days</p>	<p>If history of immediate hypersensitivity to penicillin or cephalosporin : IV Fosfomycin</p> <p>If history of immediate hypersensitivity to penicillin or cephalosporin : IV Fosfomycin</p>	<p>Do not give Ceftriaxone with calcium containing fluids</p>
<p>For unconfirmed disease: Children > 3 months</p>	<p>IV Ceftriaxone for at least 10 days</p>	<p>If history of immediate hypersensitivity to penicillin or cephalosporin : IV Fosfomycin</p>	<p>Failed lumbar puncture or negative blood/CSF culture and/or blood/CSF PCR Do not give ceftriaxone with calcium containing fluids</p>



MENINGOCOCCAL MENINGITIS PROPHYLAXIS

ELIMINATION OF NASAL CARRIAGE OF ORGANISMS

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>Prophylaxis of meningococcal meningitis</p> <p>Neonate</p> <p>Child 1 month – 5 years</p> <p>Child 5 – 12 years</p> <p>Child 12-18 years</p> <p>Neonate</p> <p>Child 1 month – 1 year</p> <p>Child 1-12 years</p> <p>Child 12-18 years</p>	<p>PO Ciprofloxacin: 30mg/kg (max 125mg) as single dose</p> <p>30mg/kg (max 125mg) as single dose</p> <p>250mg as single dose</p> <p>500mg as a single dose OR</p> <p>PO Rifampicin: 5mg/kg every 12 hours for 2 days</p> <p>5mg/kg every 12 hours for 2 days</p> <p>10mg/kg (max 600mg) every 12 hours for 2 days</p> <p>600mg every 12 hours for 2 days</p>		<p>Must be given to any baby / child who has not received ceftriaxone</p> <p>(Ciprofloxacin is not licensed for meningococcal prophylaxis).</p> <p>Stains body fluids orange including urine, saliva and tears</p> <p>Can stain contact lenses. Reduces effectiveness of hormonal contraceptives, alternative measures must be used.</p>

URINARY TRACT INFECTIONS

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
Children < 3 months with possible UTI¹	IV Cefotaxime + IV Amoxicillin		Treat as per feverish illness in children (see page 12)
Acute pyelonephritis Infants and children > 3 months	IV Ceftriaxone for 72 hours then review. Step down to PO cefalexin or as per sensitivities Duration: 10 days	IV Gentamicin for 72 hours then review. Step down to PO Trimethoprim if sensitive Duration: 10 days	Ceftriaxone contra-indicated in G6PD deficiency, impaired renal function
Cystitis/Lower UTI¹ Infants and children > 3 months	1st Line: PO Cefalexin 2 nd line: PO Trimethoprim Duration: 3 days	PO Trimethoprim	Asymptomatic bacteriuria should not be treated with antibiotics
UTI Prophylaxis If prophylaxis warranted	PO Trimethoprim		

BONE AND JOINT INFECTIONS

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>Osteomyelitis and Septic Arthritis Organisms:</p> <p>< 3 months Group B Strep. Staph aureus Coliforms</p>	<p>IV Cefotaxime + if sepsis or meningitis IV amoxicillin (stop amoxicillin when listeria meningitis excluded) Step down to PO Co-amoxiclav Duration: 14 – 21 days IV, treat for 6 weeks total</p>		<p>See also feverish illness in children (page 12)</p>

<p>3 months to 5 years Staph. aureus Kingella kingae S pneumoniae Haemophilus sp. E coli</p>	<p>IV Ceftriaxone + PO Fusidic acid /Sodium fusidate</p> <p>Duration: 4 weeks IV or depending on radiology or clinical decision</p>	<p>IV Clindamycin + PO Fusidic acid /Sodium fusidate</p> <p>Duration 4 weeks IV or depending on radiology or clinical decision</p>	<p>Suspension = fusidic acid and dosing is higher than sodium fusidate tablets.</p> <p>If source identified and sensitive can step down to PO Flucloxacillin if appropriate</p>
<p>> 5 years Staph. aureus</p>	<p>IV Flucloxacillin</p> <p>Duration: 4 weeks IV or depending on radiology or clinical decision</p>	<p>IV Clindamycin</p> <p>Duration: 4 weeks IV or depending on radiology or clinical decision</p>	

SKIN AND SOFT TISSUE INFECTIONS

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
<p>Erysipelas Group A Strep (most common) Staph. aureus</p> <p>If severe</p>	<p>PO Phenoxymethylpenicillin (Penicillin V)</p> <p>If known Staph aureus PO Flucloxacillin</p> <p>Duration 7-10 days based on clinical decision, further treatment if indicated clinically</p> <p>IV Benzylpenicillin Or if known Staph aureus IV Flucloxacillin</p> <p>Duration 7-10 days based on clinical decision, further treatment if indicated clinically</p>	<p>PO Erythromycin Or PO Clarithromycin</p> <p>Duration 7-10 days based on clinical decision, further treatment if indicated clinically</p> <p>IV Clindamycin</p> <p>Duration 7-10 days based on clinical decision, further treatment if indicated clinically</p>	<p>Increasing resistance of group A Strep against macrolides, review if no improvement</p>

<p>Cellulitis Staph aureus Group A Strep or other Streptococci</p> <p>Severe</p> <p>Less severe or step down</p>	<p>IV Benzylpenicillin + IV Flucloxacillin</p> <p>Duration 7-10 days based on clinical decision, further treatment if indicated clinically</p> <p>PO Flucloxacillin</p> <p>Duration 7-10 days based on clinical decision, further treatment if indicated clinically</p>	<p>IV Clindamycin</p> <p>Duration 7-10 days based on clinical decision, further treatment if indicated clinically</p> <p>PO Clindamycin</p> <p>Duration 7-10 days based on clinical decision, further treatment if indicated clinically</p>	
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Infection	Antibiotic Therapy	Penicillin Allergy	Comments
Infected Eczema Staph aureus	1 st line: PO Flucloxacillin 2 nd line: PO Co-amoxiclav Duration: 10 days	PO Erythromycin or PO Clarithromycin Duration: 10 days	As guided by skin swabs
Preseptal (Periorbital) Cellulitis Staph aureus Coagulase negative staph Streptococci Anaerobes Haemophilus influenzae	IV Co-amoxiclav Duration: Ideally 2 weeks, however oral step down can be considered on clinical grounds	IV Clindamycin Duration: Ideally 2 weeks however oral step down can be considered on clinical grounds	Risk of extension into the orbit in young children

<p>Orbital cellulitis Strep pneumoniae Staph aureus Strep pyogenes H. influenzae Anaerobes</p> <p>< 3 months</p> <p>> 3 months</p>	<p>IV Cefotaxime</p> <p>IV Ceftriaxone</p>	<p>IV Clindamycin + IV Aztreonam</p>	<p>Ophthalmic Emergency Infection of soft tissues behind orbital septum. Refer urgently to Ophthalmology Refer to ENT</p> <p>If no improvement within 48 hours consider adding IV Metronidazole + IV Clindamycin</p>
	<p>Duration: Minimum 2 weeks , longer if needed</p>		
<p>Dog bite / Human bite</p>	<p>PO Co-amoxiclav</p> <p>Duration: 5 to 7 days</p>	<p>PO Metronidazole and PO Erythromycin or Clarithromycin</p> <p>Duration: 5 to 7 days</p>	

OPHTHALMIC INFECTIONS

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
Conjunctivitis	Chloramphenicol eye drops 0.5% Duration: 5 days or based on clinical improvement		

DENTAL INFECTIONS

Infection	Antibiotic Therapy	Penicillin Allergy	Comments
Dental Abscess	PO Metronidazole Duration: 7 to 14 days Review day 3, if no improvement add PO Amoxicillin	PO Metronidazole Duration: 7 to 14 days Review day 3, if no improvement add PO Clindamycin	

SURGICAL PROPHYLAXIS

Procedure	Prophylactic Antibiotic	Penicillin Allergy	Comments
Tonsillectomy	Antibiotic prophylaxis not recommended		
Adenoidectomy by curettage	Antibiotic prophylaxis is not recommended		
Grommet insertion	Single topical dose Chloramphenicol ear drops		
Appendicectomy	At induction: IV Amoxicillin 50mg/kg (max 2g) + IV Metronidazole infusion Child if 17kg or more give 500mg (if less than 17 kg give 30mg/kg)	At induction: IV Gentamicin 2.5mg/kg + IV Metronidazole infusion if 17kg or more give 500mg (if less than 17 kg give 30mg/kg)	If gangrenous appendix then change to IV Amoxicillin + IV Metronidazole for 5 days

Colorectal surgery	At induction: IV Amoxicillin 50mg/kg (max 2g) + IV Metronidazole infusion if 17kg or more give 500mg (if less than 17 kg give 30mg/kg)	At induction: IV Gentamicin 2.5mg/kg + IV Metronidazole infusion if 17kg or more give 500mg (if less than 17 kg give 30mg/kg)	If further treatment is required post-op switch to IV Amoxicillin + IV Metronidazole
Splenectomy	Antibiotic prophylaxis is not recommended Consider in immunosuppression		
Open surgery for closed fractures	At induction: IV Co-Amoxiclav	At Induction: IV Clindamycin	

Thanks for your attention

