Antibiotics
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Questions to ask before selecting an antibiotic:

1. Host Factors:
   - Normal or abnormal immune status?
   - Underlying disease that will affect selection and/or dosing? (e.g. renal failure)
   - Seriousness of the infection?
2. Pathogen Factors:
   - What are the most likely bugs based on the infection site?
   - Where was the infection acquired? (community or hospital setting?)
   - Local susceptibility patterns?
3. Drug Factors:
   - Bioavailability at infected site? (e.g. blood-brain barrier?)
   - Broad or narrow spectrum?
   - Bacteriocidal or bacteriostatic?
   - Side effect profile?

General Principles:

1. Be elegant. Use the antibiotic with the narrowest spectrum that covers the pathogen.
2. Be smart. If a patient is very sick or immunocompromised, it's OK to cover broadly for the first 1-3 days while you identify the pathogen as long as you narrow your choice as soon as possible.
3. Follow the 3 day rule: Broad spectrum antibiotics markedly alter the normal host flora about 3 days into therapy AND cultures should be back in 3 days so always reassess your antibiotic choices and narrow it when possible.
4. Asume nothing. If a patient needs IV antibiotics, then you need to make sure it is hanging within the time frame you determine reasonable.
5. New isn't always better. When several antibiotics have similar coverage, select the least expensive.

Antibiotic Positive Coverage:

1. Gram Positive Coverage:
   - Penicillins (ampicillin, amoxicillin) penicillinase resistant (Dicloxacillin, Oxacillin)*
   - Cephalosporins (1st and 2nd generation)*
   - Macrolides (Erythromycin, Clarithromycin, Azithromycin)
   - Quinolones (gatifloxacin, moxifloxacin, and less so levofloxacin)*
   - Vancomycin* (MRSA)
   - Sulfonamide/trimethoprim*(Increasing resistance limits use, very inexpensive)

- Clindamycin*
- Tetracyclines
- Chloramphenicol (§causes aplastic anemia so rarely used)
- Other: Linezolid, Synercid (VRE)

2. Gram Negative Coverage:
   - Broad spectrum penicillins (Ticarcillin-clavulanate, piperacillin-tazobactam)*
   - Cephalosporins (2nd, 3rd, and 4th generation)*
   - Aminoglycosides* (renal and ototoxicity)
   - Macrolides (Azithromycin)*
   - Quinolones (Ciprofloxacin)*
   - Monobactams (Azetreonam)*
   - Sulfonamide/trimethoprim*
   - Carbapenems (Imipenem)
   - Chloramphenicol
3. Pseudomonas Coverage:
   - Ciprofloxacin
   - Aminoglycosides
   - Some 3rd generation cephalosporins
   - 4th generation cephalosporins
   - Broad spectrum penicillins
   - Carbapenems
4. Anaerobic Coverage:
   - Metronidazole*
   - Clindamycin*
   - Broad spectrum penicillins*
   - Quinolones (Gatifloxacin, Moxifloxacin)
   - Carbapenems
   - Chloramphenicol
5. Atypical Coverage:
   - Macrolides (Legionella, Mycoplasma, chlamydiae)*
   - Tetracyclines (rickettsiae, chlamydiae)*
   - Quinolones (Legionella, Mycoplasma, Chlamydia)*
   - Chloramphenicol§ (rickettsiae, chlamydiae, mycoplasma)
   - Ampicillin (Listeria)

6. Deciphering Cephalosporins:
   4 generations based on coverage with improving gram negative coverage as generation number increases. Learn only one oral and one IV drug per generation. (4th generation only IV)

   - **1st generation (Cefazolin and Cephalexin):** Good gram positive coverage, inexpensive, and used primarily to treat skin and soft tissue infections.
   - **2nd generation (Cefuroxime):** Some gram positive and gram negative coverage, expensive, and rarely used as 1st line therapy except sometimes for PID.
   - **3rd generation (Ceftriaxone):** Good gram negative coverage except pseudomonas, long half-life (q24 hr dosing), crosses blood-brain barrier, biliary and renal clearance.
   - **4th generation (Cefipime):** Good gram positive (except MRSA) and gram negative coverage, including pseudomonas, crosses blood-brain barrier, good for nosocomial infections.

   * Classes you should become familiar with.

Table 1: Classification of Antibiotics by Spectrum of Activity

Narrow	Moderately Broad	Broad	Very Broad
Penicillin	Ampicillin	Ampicillin-sulbactam	Ticarcillin-clavulanate
Oxacillin/nafcillin	Ticarcillin	Amoxicillin-clavulanate	Piperacillin-tazobactam
Cefazolin	Piperacillin	Ceftriaxone	Imipenem
Cephalexin/cephradine	Cefoxitin	Cefotaxime	Meropenem
Aztreonam	Cefotetan	Ceftizoxime	Ertapenem
Aminoglycosides	Cefuroxime-axitel	Ceftazidime	Gatifloxacin
Vancomycin	Cefaclor	Cefixime	Moxifloxacin
Macrolides	Ciprofloxacin	Cefpodoxime proxetil	
Clindamycin	Trimethoprim-sulfamethoxazole	Cefepime	
Lanazoild		Tetracycline	
Synercid		Doxycycline	
Metronidazole		Chloramphenicol	
		Levofloxacin	

Table 2: Classification of Parenteral Anti-infectives by Cost

Low	Moderate	Moderately High	High	Very High
Penicillin	Piperacillin-tazobactam	Ampicillin-sulbactam	Nafcillin	Lanazolid
Ampicillin	Cefoxitin	Imipenem	Acyclovir	Amphotericin B lipid preparations
Oxacillin	Ceftizoxime	Meropenam	Aminoglycosides	Voriconazole
Ticarcillin-clavulanate	Fluconazole			Caspofungin
Cefazolin	Ganciclovir			Cidofovir
Cefotetan	Foscarnet			Interferon
Cefuroxime				
Ceftriaxone				
Ceftazidime				
Cefepime				
Aztreonam				
Ertapenem				
Vancomycin				
Erythromycin				
Doxycycline				
Clindamycin				
Chloramphenicol				
Ciprofloxacin				
Levofloxacin				
Gatifloxacin				
Metronidazole				
Trimethoprim-sulfamethoxazole				
Amphotericin B				

Table 3: Classification of Oral Antibiotics by Cost

Low	Moderate	Moderately High	High	Very High
Penicillin-VK	Cefadroxil	Cefuroxime-axetil	Amoxicillin-clavulnate	Vancomycin
Amoxicillin	Cefaclor	Cefpodoxime	Itraconazole	Lanazolid
Dicloxacillin	Clarithromycin	Clindamycin		Ganciclovir
Cephlaexin	Azithromycin	Clindamycin		Voriconzaole
Cephradine	Ciprofloxacin	Cycloserine		Ribavirin
Cefixime	Levofloxacin	Fluconazole		
Erythromycin	Gatifloxacin			
Tetracycline	Moxifloxacin			
Doxycycline	Rifabutin			
Metronidazole	Terbinafine			
Trimethoprim-sulfamethoxazole	Valacyclovir			
INH	Flucytosine			
Rifampin				
Pyrazinamide				
Ethambutol				
Ethionamide				
Griseofulvin				
Acyclovir				