Let's Win the Race of Resistant Infections vs Antibiotics

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Disclosure Statement

- I have no personal or financial conflicts of interest relating to this presentation

Objectives

- **Analyze patient's previous cultures for appropriate antibiotic therapy**
- **Identify situations where antibiotics may not be indicated**
- **Differentiate antibiotics with serious cross-sensitivity reactions vs antibiotics safe to administer when a patient has an allergy to a specific antibiotic**

FYI

- **NOT a discussion on treatments of infections**
  - **Too large a topic for a single discussion**
  - **Best method = a different discussion for each type of infections (cellulitis, urinary, sepsis, etc)**

US Antimicrobial Resistance

- Known in humans since at least 1942
- Some infections = no current antimicrobial options
- According to CDC in 2019:
  - ❖ > 2.8 million antimicrobial resistant infections yearly
  - ❖ > 35,000 Americans die yearly due to resistant infections
- Covid caused a setback in the fight against antimicrobial resistance

Antibiotic vs Antimicrobial

- Often used interchangeably, should not be
- Antibiotics treat bacterial infections
- Antimicrobials treat bacteria, fungi, viruses, parasites
- This discussion will focus on antibiotic resistance

What Is Resistance?

- Infection overcomes therapeutic ability of medication(s)

- Occurs in microbes
  - Natural occurrence
  - Overuse and misuse of medications increases resistance

Mechanisms of Antibiotic Resistance

- Microbe mutations
- Microbe to microbe
- Pathogenic microbes kill colonized, ‘useful’, bacteria

Inappropriate Antibiotic Use

- More broad spectrum than necessary
- Upper Respiratory Tract Infection
  - Viral vs other
  - Colonized with bacteria
- Antibiotics not discontinued when no longer indicated
- Patient treated longer than recommended

Appropriate Antibiotic Use

- Follow national guidelines when available
  - Infectious Disease Society of America (IDSA)
  - Global Initiative for Chronic Obstructive Lung Disease (GOLD)
  - Surviving Sepsis Guidelines
- Appropriate antibiotic, dose and duration
- Does your facility have an antibiogram?

Cultures

- Obtain, when possible, before starting therapy
  - Normal flora vs contamination vs colonized
  - Ensure proper technique of all staff
  - Bacteremia r/o: 2 different culture sites
  - Proper patient technique for urinary tract infection
- Monitor cultures returned after patient seen
  - Ensure appropriate antibiotic choice
  - Ensure appropriate dose and length of therapy

Culture History

- Usually do not go back further than a year
  - May not be applicable to current infection
  - May be patient or institution specific
  - May be instances where is warranted, but must ensure not overtreating infection

Culture History

- Previous culture data accurate?
  - ‘clean catch’ for urinary tract infection?
  - Colonized bacteria cultured?

- Correct culture for current infection?
  - Resistance of sputum culture should not be used for toe infection
  - Urinary tract culture beneficial if patient being ruled out for urosepsis

Patient Understanding

- Variable, but largely misunderstood
  - Some believe cannot happen to them: their body is healthy, would not become resistant
  - Lack of understanding microbes develop resistance
- Lack of understanding of how Global or US resistance affects they or their family

Patient Education

- Explain how pertains to them, not Society

- May be beneficial to practice with family, friends, etc
  - Determine their initial understanding
  - Educate how resistance would affect them and those around them
  - Evaluate understanding after, ask for feedback on anything not clearly understood

Allergic vs Intolerant

- Patients may state allergic when intolerant
- Nausea, vomiting, diarrhea = intolerances
- Dizziness, ‘felt funny’, ‘didn’t get better’
- Intolerance should not prevent use of antibiotic unless severe
- Intolerance to one antibiotic in class does not always preclude use of all antibiotics in class

Allergic?

- May benefit from allergy testing
  - "I was told I'm allergic"
  - "Someone in family is allergic so I was told to never take it"
  - "I had a bad reaction when I was a child"
  - "I don't remember which antibiotic it was"
  - "I'm allergic to all antibiotics"

- Review antibiotics received since allergy listed
- Skin testing shows significant number patients not actually allergic

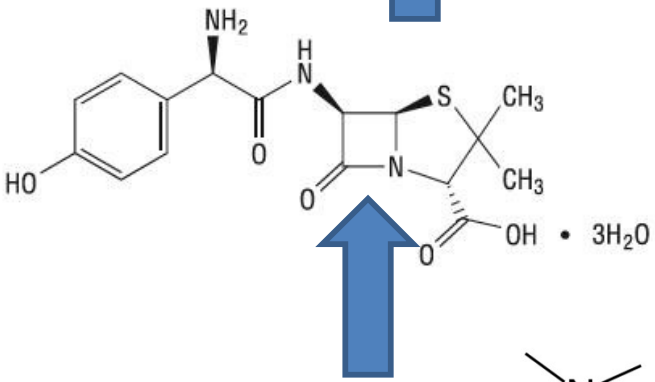
Outdated

- Patients with ‘allergy’ to penicillins can never have them again
- Unsafe for patients with ‘allergy’ to penicillins to be treated with cephalosporins
- Beta lactam ring causes cross reactivity

Chemical Structures

Cephalexin

Amoxicillin



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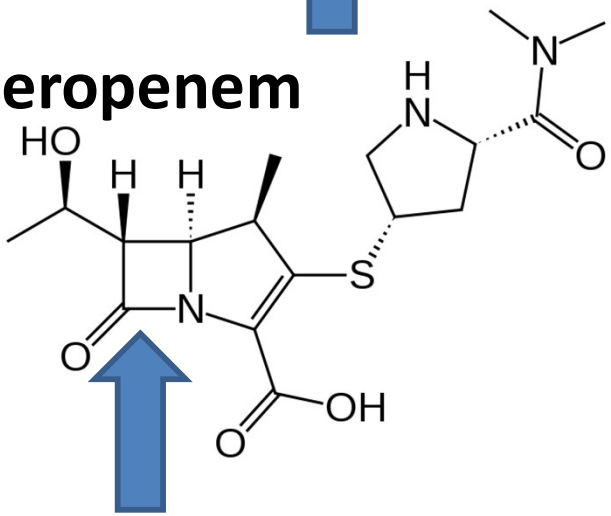
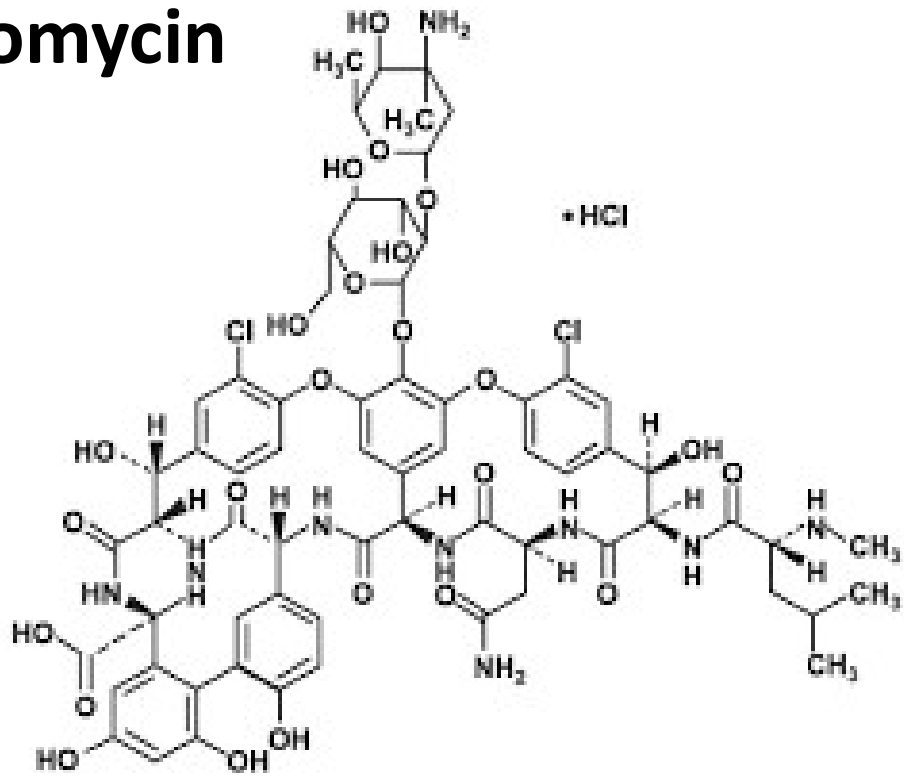
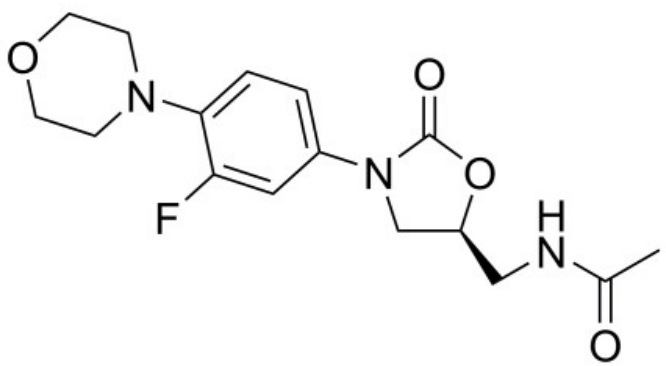


Vancomycin



Linezolid

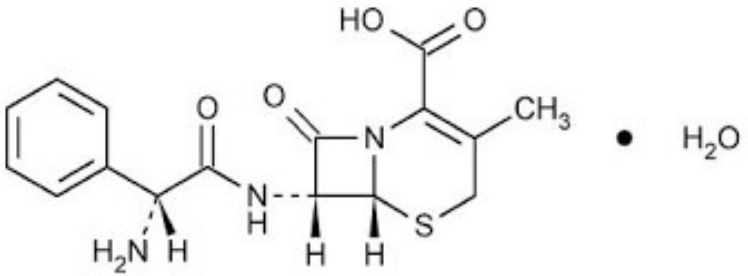


Current Data

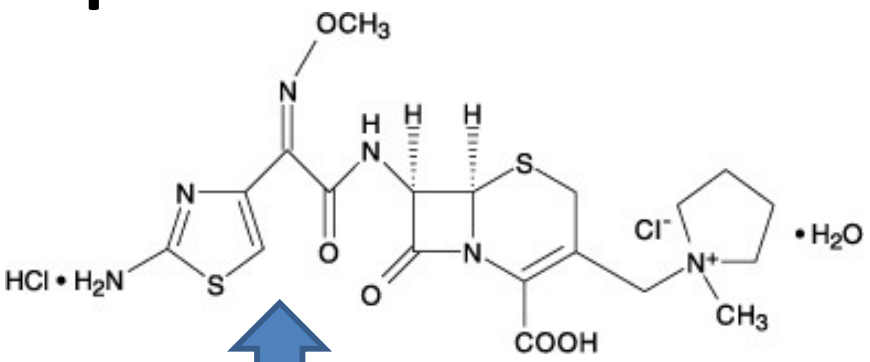
- Patients with penicillin allergy more likely to tolerate cephalosporins
  - 3rd and 4th generation unlikely to have reaction
  - 1st and 2nd generation lower cross-reactivity than previously thought
- Side chains more important than beta lactam ring
- Worth retesting patients to determine if still allergic

Chemical Structures

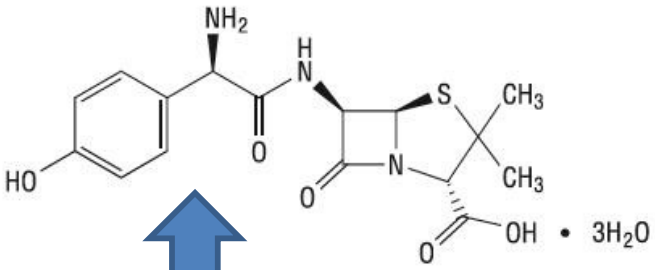
Cephalexin



Cefepime



Amoxicillin



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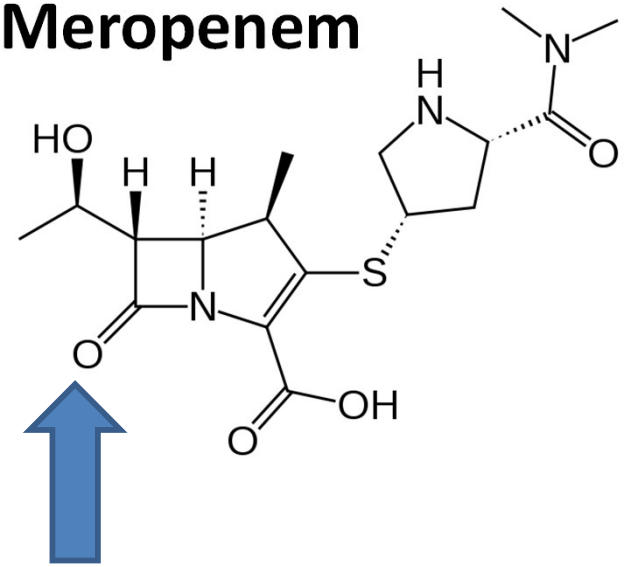

Concerns for Cross Reactivity

- Test dose protocols for less severe reactions (rash, etc)

- Involve Allergy Services for more severe reactions
  - Desensitization if required, but cannot miss doses
  - Testing, to determine if cross reactivity
  - Verify, with Allergy Service, if may have false negative skin test

Penicillins

- Anaphylaxis to one, avoid all
  - Anaphylaxis to amoxicillin avoid ampicillin-sulbactam (Unasyn), nafcillin, etc

- All Penicillins too similar in chemical structure to administer for moderate to severe reactions, unless tested first

Cephalosporins

- Side chains most likely cause of reaction
- Avoid others in same generation
- Data lacking between generations
- Monitor for future studies- NOT YET PROVEN:
  - May be safe to receive cephalosporin with different side chain
  - May even be safe if same side chain

Vancomycin

- Current MRSA screening?
- NOT for 24 to 48 hours of therapy
  - NO oral equivalent for IV -> oral antibiotics
- No cross-reactivity with other antibiotics
- ‘Infusion Related Syndrome’
  - ‘Red Man Syndrome’ inappropriate
  - Usually tolerated with slower infusion rate
  - May require diphenhydramine, can administer orally, if given an hour before vancomycin dose

Other Classes

- Macrolides and Lincomycins
  - ❖Cross-reactivity within class
  - ❖ Cross-resistance within class has been seen
  - ❖ Resistance increasing Worldwide
- Sulfamethoxazole-trimethoprim (Bactrim)
  - ❖ Resistance seen
  - ❖ Ensure dosing appropriately (single strength: SS vs double strength: DS)
  - ❖ Cross-reactivity with erythromycin-sulfisoxazole (Pediazole)

Tetracyclines

- Resistance with each in class
  - Use culture data for use
  - Antibiogram, if available, pending culture data
- Tigecycline boxed warning, risk vs benefit
- Cross reactivity within class not yet determined
  - Avoid others in class if patient is allergic

Fluoroquinolones

- Boxed warning limits use
- Increased resistance further limits use
- Cross reactivity within class

Take Home Tips

- Educate patients: direct to how may affect them and those they love
- Use current guidelines, antibiograms, to guide therapy
- Determine allergy vs intolerance
  - Allergy testing if possible and insurance covers
  - ‘Unknown’ has the power to increase antibiotic resistance

Questions?

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