

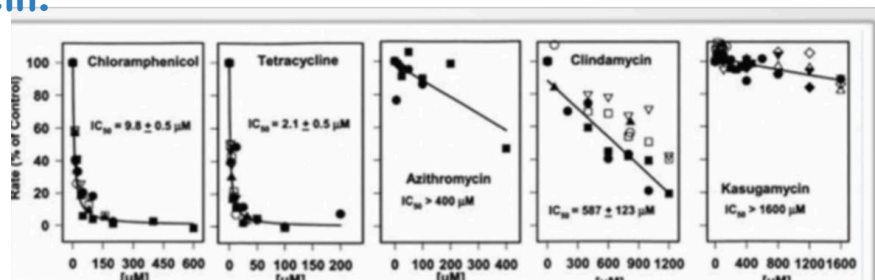
1) The graphs in the diagram represent data collected from an experiment measuring protein synthesis of human heart mitochondria incubated with one of the indicated five antibiotics. The rate of mitochondrial protein synthesis is depicted on the y axis while drug concentration is depicted on the x axis. IC₅₀ values were calculated as shown on each plot. Which of the following protein synthesis inhibitors do you expect to be associated with the most adverse reactions/toxicity?

A. Azithromycin.

B. Chloramphenicol.

C. Tetracycline.

D. Kasugamycin. .E Clindamycin.



2) A 55-year-old male patient has been hospitalized for the last 3 days after suffering from severe upper gastrointestinal bleeding. While in the hospital, and possibly due to aspiration, the patient started developing fever, dyspnea, and productive cough, with pleuritic chest pain. On examination, the patient had purulent sputum and suscultatory signs of pulmonary consolidation. Radiography showed widespread pulmonary infiltrates suggestive of MRSA infection. Your initial evaluation highly favors the possibility of nosocomial aspiration pneumonia. Which of the following antibiotics must be included in your empiric therapy regimen?

A. Linezolid

B. Daptomycin

C. Ceftriaxone

D. C e r e p i m e

E. Nafcillin

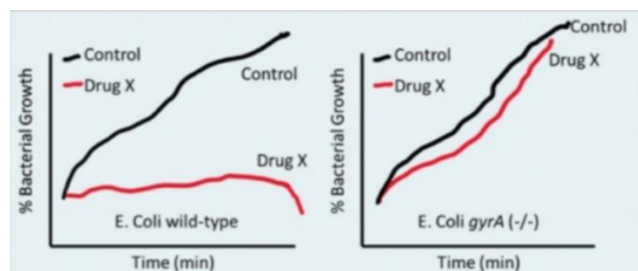




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3) A 33-year-old healthy female presents with 2-day history of dysuria (painful urination), urinary frequency and urgency. Urine culture indicated that she has an uncomplicated urinary tract infection cause by E coli. Which of the following agents will be your FIRST CHOICE for the treatment of the lady?

- A. Maxifloxacin
- B. Sulfadiazine
- C. Bacitracin
- D. Cotrimoxazole E. Nitrofurantoin.



4) In an experiment, you were identifying the growth inhibitory effect of Drug X on two strains of E. coli wild-type (regular) strain vs. E coli gyra knockouts ($gyrA^{-/-}$ which means it is missing the gene gyA) as shown in graph A and B, respectively. Based on the data shown in both ligants, you highly suspect that Drug X is?

- A. Clarithromycin
- B. Daptomycin
- C. Levofloxacin.
- D. Trimethoprim
- E. Linezolid.

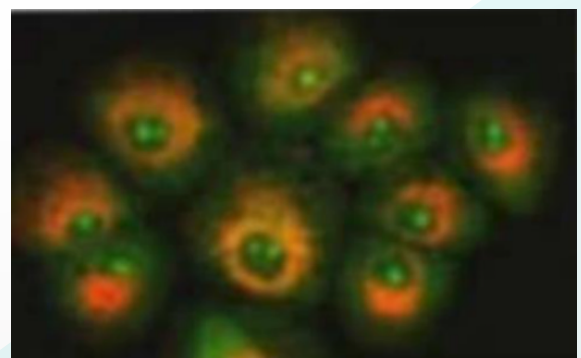


5) A 44-year-old AIDS male patient presents to the clinic with dyspnea, fever, and tiredness. His chest \times ray shows typical lobar pneumonia. Sputum was collected for culture which was positive for the fungus *Histoplasma capsulatum*. Which of the followings is the drug of choice for the treatment of pneumonia in this patient?

- A. Ceftriaxone
- B. Itraconazole
- C. Fluconazole
- D. Voriconazole E. Paromomycin

6) H460 is a non-small cell lung cancer cell line used frequently for in vitro studies of anticancer drug sensitivity H460 cells were exposed to 1 micromolar camptothecin for 24 hours in culture. After 48 hours the cells were growth- arrested and stained positive for acridine orange staining (orange color in the image) indicative of autophagy induction. The induction of autophagy in H460 cells in response to camptothecin is most likely due to which type of DNA damage?

- A. Single-stranded DNA breaks
- B. Double-stranded DNA breaks
- C. Inter- and intrastrand DNA crosslinks
- D. Methylation of the O6 position of guanine E. Insertion-deletion

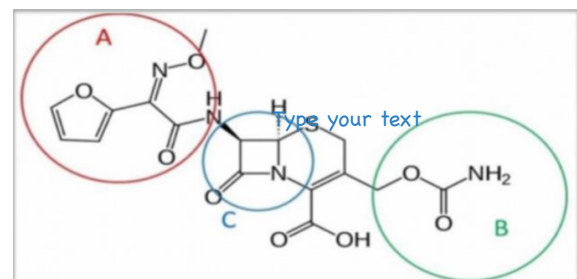




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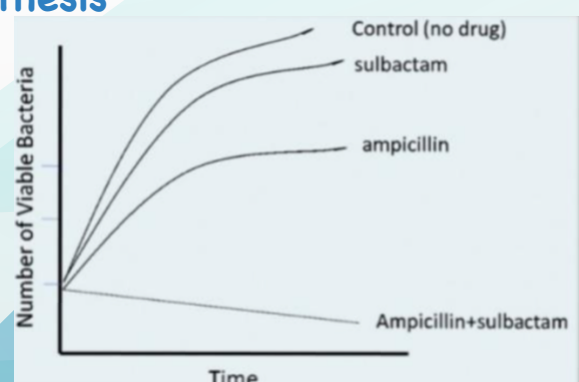
7) The following diagram depicts the chemical structure of cefuroxime. Based on your understanding of the structure-effect relationship of cephalosporins, which of the following statements is correct?

- A. Group A is responsible for the pharmacokinetic properties of cefuroxime.
- B. Group C is responsible for the activity of cefuroxime against MRSA
- C. Group Bis responsible for the susceptibility of cefuroxime to beta-lactamases. D. Group A is responsible for determining the antibacterial spectrum of cefuroxime E. Group C is responsible for the extent of hepatic metabolism of cefuroxime.



8) The diagram represents viability results from an experiment testing the antibacterial effects of the indicated drugs against E coll in vitro. The synergistic effect observed in the drug combination group is most likely due to?

- A. Inhibition of bacterial beta-lactamase activity
- B. Upregulation of penicillin binding proteins
- C. Inhibition of proteoglycan membrane transport
- D. Activation of gram-negative cell wall proteins
- E. Inhibition of cytosolic proteoglycan synthesis





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Answers

1: C

2: A

3: E

4: C.

5: B

6: A

7: D

8: A



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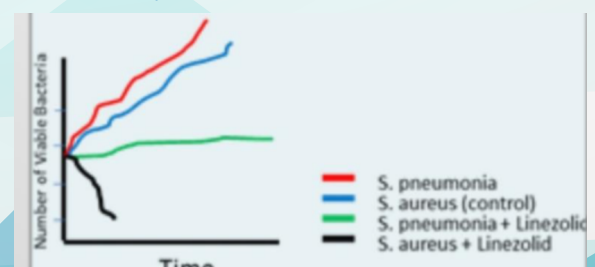
1) A 39-year-old man presents to the emergency department with productive cough, dyspnea, malaise, fever, and weight loss. On examination he had multiple crusted papules and ulcers on the trunk area. His chest x-ray shows interstitial infiltrates. The patient reported

that he spent the last month in a trip to South America. Sputum was collected for culture which was positive for the fungus *Paracoccidioides brasiliensis*. Which of the followings is the DRUG OF CHOICE for the treatment of pneumonia in this patient?

- A. Amphotericin
- B. Amoxicillin + clavulanic acid
- C. Ceftriaxone
- D. Voriconazole
- E. Itraconazole

2) The diagram represents the data obtained from an experiment testing the antibacterial effect of the antibiotic linezolid on two species of gram-positive bacteria. Which of the following statements correctly describes the main conclusion from the experiment?

- A. Linezolid has a postantibiotic effect against *S. aureus* but not *S. pneumoniae*
- B. Linezolid is bactericidal against *S. aureus* and bacteriostatic against *S. pneumoniae*
- C. Linezolid is bactericidal against both *S. aureus* and *S. pneumoniae*
- D. Linezolid is bacteriostatic against both *S. aureus* and *S. pneumoniae*
- E. Linezolid has a postantibiotic effect against *S. pneumoniae* but not *S. aureus*





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3) A 25-year-old man presents to the urgent care center with a painless sore on his genitals that started 2 weeks ago. He reports unprotected sex with a new partner about a month ago. A blood test confirms the patient has *Treponema pallidum* indicating that he has active syphilis. The patient has a documented beta-lactam hypersensitivity. Which of the following is the drug of choice for the treatment of this patient?

- A. Aztreonam
- B. Benzathine penicillin G
- C. Gentamicin
- D. Erythromycin
- E. Levofloxacin

4) Based on the provided characteristics of each of the following antibiotics, which one would be best to use for the treatment of a brain abscess, assuming they all have equal antibacterial potency?

- A. Penicillin G
- B. Chloramphenicol

Drug Name	Lipid Solubility	Molecular Weight	Protein Binding	Susceptibility to Pumps Efflux	Toxicity
Chloramphenicol	+++	323.132 g/mol	High	High	High
Metronidazole	+++	171.16 g/mol	Low	Moderate	Moderate
Penicillin G	+	334.4 g/mol	Extensive	Moderate	Low
Ceftriaxone	++	554.58 g/mol	Moderate	Moderate	Low
Vancomycin	+	1,449.3 g/mol	Moderate	Low	Moderate

5) Which of the following features of a cell wall inhibitor is considered a favorable characteristic and expected to make the antibiotic more effective in inducing bacterial cell killing?

- A. High susceptibility to degradation by beta-lactamases
- B. More selectivity against gram-negative vs gram positive species
- C. Reduced penetration potential through the peptidoglycan layer
- D. High binding affinity to bacterial penicillin-binding proteins
- E. High susceptibility to cell wall efflux pumps



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6) A 59-year-old female patient was diagnosed with Stage I triple-negative breast cancer. Her treatment plan consisted of neoadjuvant chemotherapy of 5-fluorouracil, Adriamycin (doxorubicin), and cyclophosphamide followed by bilateral radical mastectomy. Adjuvant chemotherapy consisted of methotrexate and docetaxel. Over the first 5 years of follow up the patients showed no signs of recurrence, but she started complaining of shortness of breath, difficulty going up the stairs, and peripheral edema. Which of the following chemotherapeutics is likely to have caused her symptoms?

- A. Adriamycin
- B. Methotrexate
- C. Cyclophosphamide
- D. 5-fluorouracil
- E. Docetaxel

7) A 55-year-old male patient was brought to the emergency room with high fever, tachypnea, productive cough and chest pain. Chest X-ray showed lobar pneumonia as shown in the film. The patient is a smoker and has uncontrolled diabetes. The patient was admitted to the ICU and empirical antibiotic treatment was initiated. Which of the following antibiotics must be included?

- A. Vancomycin
- B. Telavancin
- C. Levofloxacin
- D. Tobramycin





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8- In the laboratory, Dr. Hafez Almomani runs experiments studying the bacteriostatic effects of tetracycline on bacterial cultures of *Helicobacter Pylori*.

Initially, tetracycline produced concentration-dependent antibacterial activity against *H. pylori*, but after repeated exposure to the drug, bacteria started developing resistance. Which of the following mechanisms can explain the reduced sensitivity to tetracycline?

- A. Mutations in 16S rRNA of the 30S subunit of the bacterial ribosome
- B. Adenine methylation in the 23S rRNA of the 50S subunit of the bacterial ribosome
- C. Plasmid-mediated increased expression of the 30S subunit of the bacterial ribosome
- D. Alteration of the peptidyl-transferase activity the 50S subunit of the bacterial ribosome
- E. Reduced expression of the 23S rRNA of the 50S subunit of the bacterial ribosome



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Answers

1: E

2: B

3: D

4: D

5: D

6: E

7: C

8: A