

List of teams:

1. Group 1 - Room 304 - Dr. Dobkin
2. Group 2 - Room 306 - Dr. Yin
3. Group 3 - Room 308 - Dr. Lowy
4. Group 4 - Room 310 - Dr. Neu
5. Group 5 - Room 316 - Dr. Prince
6. Group 6 - Room 320 - Dr. Hammer
7. Group 7 - Room 322 - Dr. Gordon
8. Group 8 - Room 324 - Dr. Sobieszczyk
9. Dental students

Practice question:

Which of the following individuals was among the first to recognize the importance of handwashing?

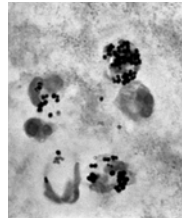
1. Rebecca Lancefield
2. William Osler
3. Frank Lowy
4. **Ignaz Semmelweiss**
5. John Snow



Hint!

Team Leader Board

A 43-year old insulin requiring diabetic has a history of recurrent skin abscesses. He presents now with an infected joint. The Gram stain of his fluid is shown. Which of the following statements concerning his infection is correct?

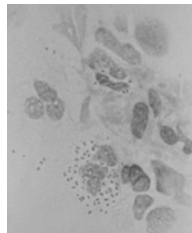


1. A vaccination might have prevented this infection
2. Alpha toxin is responsible for the predilection of this bacteria for bones and joints
3. **He was likely infected by the strain with which he was nasally colonized**
4. The most important cell involved in host defense is the macrophage
5. He will develop lifelong immunity following treatment of this infection

A newly recognized infectious disease has been discovered. The pathogen cannot be cultured on conventional (or unconventional) media. On histopathological examination bacteria are however visible in the involved tissue. Which of the following approaches is most likely to help identify and characterize these new microorganisms?

1. Gram stain of the involved tissue
2. **16S ribosomal analysis by PCR**
3. Biochemical profile using the Microscan
4. Serological screen of the patient's sera for likely pathogens
5. Pulsed field gel electrophoresis

The CSF Gram stain below was obtained from a 17-year old boy admitted to the hospital with nausea, vomiting and headache. Which of the following statements concerning his infection is correct?



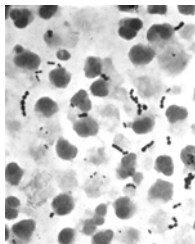
1. Patients sitting in the ER when he was there should receive prophylaxis
2. Teichoic acid in the cell wall is primarily responsible for the host inflammatory response
3. No vaccination is available for this particular species
4. The same antibiotic is used for treatment of and prophylaxis against this agent
5. **Transmission of this agent occurs primarily by respiratory secretions**

A vaccine to prevent *Neisseria gonorrhoeae* infections has proved difficult to develop for which of the following reasons?

1. The pilin proteins are relatively nonimmunogenic
2. There is a significant risk that antibodies to pilin proteins will cross-react with cervical tissue and cause damage
3. **The *N. gonorrhoeae* chromosome contains multiple copies of the pilin genes which allows antigenic variation to occur**
4. New pilin genes are acquired from *N. meningitidis* because both species are naturally competent and colonize the same sites
5. Antibodies directed against pilin proteins are not neutralizing and therefore not protective

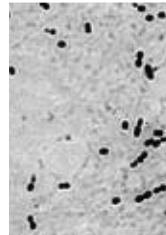
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The Gram stain below was isolated from an oropharyngeal abscess that complicated an episode of severe pharyngitis in a 7-year old boy. Which of the following statements concerning the pharyngitis is correct?



1. The most common nonsuppurative complication of this infection is glomerulonephritis
2. The organism responsible for this infection is often penicillin resistant
3. The organism causing this infection is both catalase and coagulase positive
4. This organism is primarily spread by fomites
5. **Antibody directed against the M protein is strain specific**

A 77-year old man develops a fever with a productive cough and right-sided pleuritic chest pain. The Gram stain is shown. A chest X-ray reveals a lobar infiltrate. Which of the following statements concerning his infection is correct?



1. The peak incidence of this infection is in the 6 month to 7 year age group
2. **The early mortality from this infection is not prevented by the administration of antibiotics**
3. Infection usually results from hematogenous dissemination from another infected site
4. The organism is identified in the laboratory by its susceptibility to the bacitracin disk
5. The polysaccharide capsule causes the inflammation associated with this infection

A 29-year old HIV-infected male presents with shortness of breath and a diffuse interstitial infiltrate. You suspect that he has pneumocystis pneumonia and institute empiric therapy. What is the mechanism of action of the likely agent with which you choose to treat this infection?

1. Blocks DNA synthesis
2. Inhibits protein synthesis
3. **Inhibits folic acid synthesis**
4. Interferes with cell wall synthesis
5. Disrupts the cytoplasmic membrane

A 63-year-old man undergoes aortic valve replacement. Five days following surgery he develops fever and a new aortic valve insufficiency murmur. Endocarditis is suspected. Blood cultures drawn at the time of his fever are positive. Which of the following pathogens is the most likely cause of this infection?

1. *Escherichia coli*
2. *Pseudomonas aeruginosa*
3. ***Staphylococcus epidermidis***
4. Viridans streptococcus
5. *Enterococcus faecalis*

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A 7 year old girl develops bloody diarrhea followed by the onset of the hemolytic uremic syndrome. The infection followed ingestion of unpasteurized apple juice. Which of the following statements concerning the pathogen responsible for this illness is correct?

1. The toxin elaborated by this pathogen is an example of an enterotoxin
2. The toxin elaborated by this pathogen causes the accumulation of cyclic AMP
3. A superantigen elaborated by the pathogen causes the hemolytic uremic syndrome
4. The hemolytic uremic syndrome occurs more frequently in adults than children
5. **The Shiga toxin elaborated by this pathogen interferes with protein synthesis**

A 75 year old man is diagnosed with *S. aureus* endocarditis. His isolate is resistant to penicillin and methicillin. The appropriate choice for treatment of his infection is which of the following antibiotics?

1. A third generation cephalosporin
2. Erythromycin (macrolide)
3. Trimethoprim-Sulfamethoxazole
4. **Vancomycin**
5. An aminoglycoside

A scientist identifies a new virulence determinant. He believes that it is transferred between species by conjugation. Which of the following would he need to demonstrate to prove this hypothesis?

1. That a temperate phage must be present
2. **That cell to cell contact is necessary**
3. That the recipient strain must be naturally competent
4. That transfer is prevented by treatment with DNase
5. That a single point mutation occurred

A 48-year old paraplegic with an indwelling Foley (urinary bladder) catheter develops a recurrent UTI caused by a quinolone-resistant klebsiella. He has a history of renal disease and is penicillin allergic (hives!). Which of the following antibiotics would be a good choice to treat this infection?

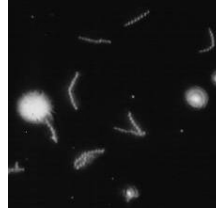
1. Vancomycin (a glycopeptide)
2. **Aztreonam (monobactam)**
3. Gentamicin (an aminoglycoside)
4. Ampicillin (a penicillin)
5. Erythromycin (a macrolide)

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A 44-year old man hospitalized for cholecystitis develops a vancomycin-resistant enterococcal infection following treatment with a cephalosporin. The mechanism of resistance for this isolate is an example of which of the following?

1. Enzymatic breakdown of vancomycin
2. Porin mutation preventing penetration of vancomycin to its bacterial target
3. **Modification of the vancomycin target on the bacteria**
4. Mobilization of an efflux pump that removes vancomycin
5. Insertion into cytoplasmic membrane and subsequent loss of potassium

A 21 year old sexually active male develops a painless ulcer on the shaft of his penis. A scraping of this lesion reveals the image below. Based on this information you would treat him with an antibiotic with which of the following mechanisms of action?



1. **Interferes with cell wall synthesis**
2. DNA gyrase inhibitor
3. Inhibits protein synthesis
4. Interferes with folic acid synthesis
5. Damages bacterial cytoplasmic membranes

A five month old infant is brought to the ER with paroxysmal coughing. The father tells you that during these episodes the baby turns "blue". The laboratory exam reveals an elevated WBC count with a marked lymphocytosis. The likely diagnosis is which of the following?

1. *Legionella pneumophila*
2. *Chlamydia trachomatis*
3. *Streptococcus pneumoniae*
4. *Mycoplasma pneumoniae*
5. ***Bordetella pertussis***

A 21-year old sexually active female develops a new urinary tract infection. This is the third infection that she has had in the past two years. There is no history of anatomic abnormalities of her genitourinary system. The most likely pathogen responsible for these infections is which of the following bacterial species?

1. *Staphylococcus saprophyticus*
2. *Klebsiella pneumoniae*
3. ***Escherichia coli***
4. *Pseudomonas aeruginosa*
5. *Enterococcus faecalis*

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A 37-year old avid gardener develops the accompanying rash. Six weeks later he develops a left-sided facial palsy (Bell's palsy). Which of the following pathogens is responsible for his illness?



1. *Rickettsia rickettsii*
2. *Rickettsia akari*
3. *Ehrlichia (Anaplasma phagocytophilum)*
4. *Chlamydia psittaci*
5. ***Borrelia burgdorferi***

A 33 year old female is empirically treated for neutropenic (low white count) fever with a third generation cephalosporin. She improves on therapy, however five days later she has a new fever and her blood cultures are positive. Which of the following bacterial pathogens should you consider in deciding on your new empiric therapy?

1. *Hemophilus influenzae*
2. ***Enterococcus faecalis***
3. *Escherichia coli*
4. *Helicobacter pylori*
5. *Viridans streptococci*

A second year medical student decides that she needs a vacation after just passing her MID course. She goes to Cancun with friends. Three days into her stay she develops explosive, watery diarrhea. She has no fever and is otherwise fine. Which of the following statements concerning her illness is true?

1. Histologically you would expect to see erosions in her large bowel
2. The pathogen responsible for this infection spreads from cell to cell by mobilizing intracellular actin
3. Only a relatively small number of organisms (*e.g.*, 10-100) are generally needed to cause infection
4. **Her symptoms result from the mobilization of water out of cells by a toxin that functions in a manner that is similar to the action of cholera toxin**
5. Examination of her stool is likely to reveal numerous white blood cells

Much to everyone's surprise the medical student grows out a Gram negative rod from her stool. It is a nonlactose fermenter that is also oxidase negative and H₂S positive. The likely pathogen is which of the following?

1. *Escherichia coli*
2. *Pseudomonas aeruginosa*
3. ***Salmonella typhimurium***
4. *Klebsiella pneumoniae*
5. *Clostridium difficile*

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A two day old neonate develops a stiff neck and a fever. He has a lumbar puncture that reveals a high CSF protein, a low CSF glucose and Gram positive cocci in chains. Biochemical tests reveal that the organism is catalase negative, optochin and bacitracin disk negative. The organism is likely to be which of the following?

1. Group A streptococcus (*S. pyogenes*)
2. Viridans streptococcus
3. *Streptococcus pneumoniae*
4. **Group B streptococcus (*S. agalactiae*)**
5. *Enterococcus faecalis*

A 30-year-old medical resident tries some home canned mushrooms brought to her by a clinic patient. She develops difficulty speaking, followed by a descending paralysis. The toxin mechanism responsible for this is which of the following?

1. Toxin causes illness by directly stimulating neural receptors and also stimulating peristalsis
2. Toxin binds directly to the MHC class 2 receptor and the T cell receptor releasing large quantities of cytokines
3. **Toxin binds to the neuromuscular junction and prevents acetylcholine release**
4. Toxin blocks the postsynaptic inhibition of spinal motor reflexes
5. Toxin binds a GTP binding protein that results in the accumulation of cyclic AMP

Which of the following bacterial components or products is unique to Gram negative bacteria?

1. Spores
2. Mitochondria
3. Capsules
- 4. Porins**
5. Biofilms

A farmer is treating his chickens with tetracycline to enhance their rate of growth. A food inspector comes by to report that the farmer's chickens are now colonized with *Escherichia coli* that are resistant to the tetracycline as well as to a number of other antibiotic families. Which of the following is the most likely explanation for this?

1. Development of a new permeability barrier
2. Enzymatic modification of multiple antibiotic families
3. Alteration of the antibiotic target for multiple drug families
- 4. Induction of a multidrug efflux pump**
5. Mutation of a porin protein that mediates entry of several antibiotic families

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