AAB Medical Technologist (MT) – Microbiology Practice Exam (Sample)

Study Guide

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Questions

1. Beta-lactamases are defined as enzymes that provide resistance to which type of antibiotics?

A. Aminoglycosides

B. Quinolones

C. Beta-lactam antibiotics

D. Tetracyclines

2. Clue cells may be found in infections with which organism?

A. Streptococcus agalactiae

B. Gardnerella vaginalis

C. Treponema pallidum

D. Mycoplasma pneumoniae

3. Rice water stools often contain a pure culture of which organism?

A. Escherichia coli

B. Vibrio cholerae

C. Salmonella typhi

D. Shigella dysenteriae

4. Which tests are most effective in differentiating Mycobacterium tuberculosis from Mycobacterium bovis?

A. Oxidase and urease tests

B. Niacin and nitrate tests

C. Catalase and coagulase tests

D. API and Vitek tests

5. Nocardia will grow on any medium that does not contain...

A. Nutrients

B. Oxygen

C. Antibiotics

D. Sugar

6. How are rickettsial diseases transmitted?

- **A. Airborne particles**
- **B. Direct contact**
- **C. Contaminated water**
- **D. Arthropod vectors**

7. Which biochemical feature is indicative of a positive catalase test?

- **A. Color change to yellow**
- **B. Bubble formation upon H_2O_2 application**
- **C. Change in pH**
- **D. Growth on specific media**

8. In the Kirby-Bauer susceptibility test, what is the purpose of the 0.5 McFarland standard?

- **A. To determine the pH of the inoculum**
- **B. To adjust the turbidity of the inoculum**
- **C. To calibrate the incubation temperature**
- **D. To measure the growth rate of bacteria**

9. What is the primary causative agent of primary atypical pneumonia?

- **A. Streptococcus pneumoniae**
- **B. Mycoplasma pneumoniae**
- **C. Chlamydia pneumoniae**
- **D. Legionella pneumophila**

10. In microbiological testing, what does a Gram-negative diplococci suggest?

- **A. It is likely Staphylococcus**
- **B. It may indicate Neisseria or Moraxella**
- **C. It is typically a Sign of a viral infection**
- **D. It suggests a rapid antibiotic sensitivity**

Answers

1. C
2. B
3. B
4. B
5. C
6. D
7. B
8. B
9. B
10. B

Explanations

1. Beta-lactamases are defined as enzymes that provide resistance to which type of antibiotics?

A. Aminoglycosides

B. Quinolones

C. Beta-lactam antibiotics

D. Tetracyclines

Beta-lactamases are enzymes produced by certain bacteria that provide resistance to beta-lactam antibiotics. These antibiotics include penicillins, cephalosporins, and other related compounds that have a characteristic beta-lactam ring in their molecular structure. When bacteria produce beta-lactamases, they can hydrolyze the beta-lactam ring, rendering the antibiotic ineffective. This mechanism of resistance is significant in clinical settings because it allows bacteria to survive and grow in the presence of antibiotics that would otherwise kill them or inhibit their growth. The importance of beta-lactamases in microbial resistance highlights the need for ongoing surveillance and development of new antibiotics and inhibitors that can overcome this resistance mechanism. Understanding this enzymatic action is crucial for treating bacterial infections effectively.

2. Clue cells may be found in infections with which organism?

A. Streptococcus agalactiae

B. Gardnerella vaginalis

C. Treponema pallidum

D. Mycoplasma pneumoniae

Clue cells are specifically associated with bacterial vaginosis, a condition frequently linked to an overgrowth of Gardnerella vaginalis in the vaginal flora. These clue cells are vaginal epithelial cells that have a stippled appearance due to being covered with bacteria. In cases of bacterial vaginosis, the normal lactobacilli are diminished, and Gardnerella vaginalis proliferates, leading to the characteristic finding of clue cells during microscopic examination of vaginal discharge. The other organisms listed do not produce clue cells. Streptococcus agalactiae, for instance, is known for causing infections like Group B streptococcal disease but does not lead to the clue cell phenomenon. Treponema pallidum, the causative agent of syphilis, and Mycoplasma pneumoniae, which is associated with respiratory infections, are also unrelated to the presence of clue cells. Hence, Gardnerella vaginalis is the organism most directly linked to the presence of clue cells in vaginal infections.

3. Rice water stools often contain a pure culture of which organism?

A. Escherichia coli

B. Vibrio cholerae

C. Salmonella typhi

D. Shigella dysenteriae

Rice water stools are characteristic of cholera, which is primarily caused by the bacterium Vibrio cholerae. This organism leads to severe watery diarrhea, which can result in dehydration and electrolyte imbalances. The term "rice water stools" describes the appearance of the diarrhea, which is pale and watery, resembling the water used to rinse rice. Vibrio cholerae is transmitted through contaminated water and can lead to explosive outbreaks in regions with inadequate sanitation. In cases of cholera, stool samples often show a pure culture of Vibrio cholerae, making it the definitive organism associated with this clinical presentation. In contrast, the other organisms listed have different associations and clinical presentations. For instance, Escherichia coli can cause several types of gastroenteritis, but its stools do not have the typical "rice water" appearance. Salmonella typhi is responsible for typhoid fever, which presents with a different type of diarrhea and systemic symptoms. Shigella dysenteriae typically causes dysentery, characterized by bloody diarrhea rather than the watery stools associated with cholera. Thus, the presence of a pure culture of Vibrio cholerae in rice water stools is a clear indicator of cholera infection.

4. Which tests are most effective in differentiating Mycobacterium tuberculosis from Mycobacterium bovis?

A. Oxidase and urease tests

B. Niacin and nitrate tests

C. Catalase and coagulase tests

D. API and Vitek tests

The most effective tests for differentiating Mycobacterium tuberculosis from Mycobacterium bovis are the niacin and nitrate tests. Mycobacterium tuberculosis produces niacin, which can be detected in cultures, while Mycobacterium bovis does not. Therefore, the presence of niacin is indicative of M. tuberculosis. Additionally, M. tuberculosis is capable of reducing nitrate to nitrite, which can also be used as a differentiating characteristic, whereas M. bovis typically does not. These tests are particularly useful in clinical microbiology for accurately identifying the specific mycobacterial species present in a sample. Rapid and reliable differentiation is crucial, as these species can cause similar diseases but may require different treatment regimens and public health interventions. The specificity of these biochemical tests makes them valuable in aiding diagnosis and treatment decisions. In contrast, options involving the oxidase and urease tests, catalase and coagulase tests, or API and Vitek tests do not provide the critical differentiation needed between these two Mycobacterium species, making them less suitable for this specific purpose.

5. Nocardia will grow on any medium that does not contain...

A. Nutrients

B. Oxygen

C. Antibiotics

D. Sugar

Nocardia is a genus of bacteria that is aerobic and typically requires oxygen for growth, which makes it necessary for growth mediums to provide atmospheric oxygen levels. The fact that the organism will grow on any medium that does not contain antibiotics highlights the nature of Nocardia's susceptibility to these substances. In a laboratory setting, antibiotics are often used to inhibit the growth of unwanted or contaminating bacteria. Therefore, if antibiotics are present in the medium, they may prevent the growth of Nocardia, thus supporting the idea that Nocardia can thrive on a variety of nutrient-rich environments as long as they are free from antibiotics. While other options, such as nutrients, oxygen, or sugar, could theoretically influence growth conditions, they do not fundamentally inhibit Nocardia's ability to grow as antibiotics do. Nutrients are typically necessary for any form of bacterial growth, and Nocardia, being aerobic, does indeed need oxygen in its growth medium. The absence of sugar is not specifically critical for the growth of Nocardia since it can utilize a variety of carbon sources. Thus, the presence of antibiotics is the key factor that makes them unable to grow, affirming that the correct response is the prohibition of antibiotics in the growth medium for Nocardia

6. How are rickettsial diseases transmitted?

A. Airborne particles

B. Direct contact

C. Contaminated water

D. Arthropod vectors

Rickettsial diseases are primarily transmitted through arthropod vectors, which include various types of ticks, fleas, and lice. These vectors are crucial for the life cycle of rickettsiae, as they serve as the primary means by which these bacteria are spread to humans. When an infected vector bites a human, it can introduce the rickettsiae into the bloodstream, leading to the development of disease. The mechanism of transmission underscores the reliance on specific environmental conditions and the biology of the vectors involved. For instance, certain species of ticks are known to be vectors for diseases such as Rocky Mountain spotted fever and typhus. The lifecycle and behavior of these arthropods play a significant role in the epidemiology of rickettsial infections, making preventative measures, such as reducing contact with these vectors, essential for disease control. Other potential transmission methods, such as airborne particles, direct contact, or contaminated water, do not apply to rickettsial diseases. Instead, the focus remains on the involvement of arthropod vectors, which highlights the unique nature of how these diseases spread compared to other infectious diseases. Understanding this vector-dependent transmission is crucial for effective public health strategies and personal protective measures against rickettsial infections.

7. Which biochemical feature is indicative of a positive catalase test?

A. Color change to yellow

B. Bubble formation upon H2O2 application

C. Change in pH

D. Growth on specific media

The positive catalase test is indicated by the formation of bubbles upon the application of hydrogen peroxide (H2O2). This reaction occurs because catalase is an enzyme that breaks down hydrogen peroxide into water and oxygen. The visible bubbles are a direct result of the oxygen gas being released during this breakdown. The presence of catalase is a key characteristic that helps to differentiate between certain groups of bacteria, especially when distinguishing Staphylococci, which are catalase-positive, from Streptococci, which are typically catalase-negative. This test is particularly useful in microbiology for the identification of bacterial species based on their enzymatic activity.

8. In the Kirby-Bauer susceptibility test, what is the purpose of the 0.5 McFarland standard?

A. To determine the pH of the inoculum

B. To adjust the turbidity of the inoculum

C. To calibrate the incubation temperature

D. To measure the growth rate of bacteria

The purpose of the 0.5 McFarland standard in the Kirby-Bauer susceptibility test is to adjust the turbidity of the inoculum. This standardizes the concentration of the bacterial suspension to approximately 1.5 x 10^8 CFU/mL. Achieving this specific turbidity ensures that the test results are reliable and reproducible, as the effectiveness of the antibiotic susceptibility testing is significantly influenced by the density of the bacterial inoculum. When the inoculum is standardized to the 0.5 McFarland level, it provides a consistent starting point for the test, allowing for appropriate comparison of bacterial resistance or susceptibility to antibiotics across different tests and labs. Other options do not align with the primary function of the 0.5 McFarland standard. For example, determining the pH of the inoculum is not the focus of this standard, nor does it calibrate the incubation temperature or measure growth rates. Each of these elements plays a role in microbiological testing, but the specific role of adjusting turbidity is critical in the context of the Kirby-Bauer method.

9. What is the primary causative agent of primary atypical pneumonia?

A. Streptococcus pneumoniae

B. Mycoplasma pneumoniae

C. Chlamydia pneumoniae

D. Legionella pneumophila

Primary atypical pneumonia, often referred to as "walking pneumonia," is most commonly caused by Mycoplasma pneumoniae. This organism is a unique type of bacteria that lacks a cell wall, which distinguishes it from other bacterial pathogens. Mycoplasma pneumoniae primarily affects the upper and lower respiratory tracts and is known for causing mild but persistent respiratory symptoms. The disease is characterized by a gradual onset of symptoms that often include a dry cough, fever, and malaise. Because the infection can be less severe than typical pneumonia, many patients do not require hospitalization and may continue with their daily activities, hence the term "walking pneumonia." Mycoplasma pneumoniae is particularly prevalent in younger individuals, such as school-aged children and young adults, and it is transmitted through respiratory droplets. This etiological agent is especially notable because it can sometimes lead to outbreaks in crowded places, such as schools or military barracks. Other pathogens listed, such as Streptococcus pneumoniae, Chlamydia pneumoniae, and Legionella pneumophila, are associated with different forms of pneumonia, either typical or secondary atypical pneumonia, each having distinctive clinical features and treatment approaches. Thus, identifying Mycoplasma pneumoniae as the primary causative agent of

10. In microbiological testing, what does a Gram-negative diplococci suggest?

A. It is likely Staphylococcus

B. It may indicate Neisseria or Moraxella

C. It is typically a Sign of a viral infection

D. It suggests a rapid antibiotic sensitivity

A Gram-negative diplococcus is characterized by its round, paired cell arrangement and the fact that it retains the red counterstain during the Gram staining process due to its thin peptidoglycan layer. This morphology is specifically associated with certain bacterial genera, most notably Neisseria and Moraxella. Neisseria species, such as Neisseria gonorrhoeae and Neisseria meningitidis, are well-known Gram-negative diplococci and are significant pathogens in human infections. Moraxella catarrhalis, another Gram-negative diplococcus, is commonly associated with respiratory infections as well. The presence of Gram-negative diplococci in a clinical sample often points to a specific pathogenic role, particularly in cases of infection. In contrast, Staphylococcus is characterized as Gram-positive and typically appears in clusters rather than pairs. Furthermore, Gram-negative diplococci indicate bacterial infections rather than viral, which generally do not have a morphologic classification in the same way that bacterial species do. Lastly, the identification of Gram-negative diplococci does not directly suggest rapid antibiotic sensitivity; sensitivity testing is a separate laboratory process that is performed after identifying the organism. Thus, the identification of Gram-negative diplococci strongly suggests the presence of pathogens