Microbiology and Immunology 2500 A/B: Bacteriology Practice Questions

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Introduction

Dear student,

This document contains content derived from the Microbiology & Immunology 2500 course and it focuses specifically on the **bacteriology unit** by providing practice questions to help students follow along with the bacteriology content presented in lectures. This resource has been created by the Education Team at Webstraw. The Education Team consists of students that have previously taken and/or students that are currently taking Microbiology 2500 A/B

Purpose

This resource focuses on key concepts that are important for students to understand to succeed within this course. This resource was created by students for other students. Our goal is to help students (1) further develop their understanding of course content and (2) achieve greater academic success. (3) Our resource is also open access meaning there are no financial or legal barriers to students who wish to access and use our resource.

Instructions

Before the exam, we recommend that you attempt to familiarize yourself with all the content covered in the bacteriology unit. This document is a supplementary resource used to help organize all the species of bacteria in the bacteriology unit, separated by lecture.

A table of contents is provided to show where each lecture topic is located on this document.

Disclaimer: This resource is supplementary to your course content and is not meant to (1) replace any of the resources provided to you by your instructor nor is it meant to (2) be used as a tool to learn the course material from scratch. We assume that students who use this resource will have a basic understanding of the course content. This resource does not contain everything you need to know for your evaluations. Please refer to the course material provided by your instructors if there are any discrepancies between our resource and your course content.

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We wish you the best of luck on your exams!

- The WebStraw Team

Note to Instructors:
If this resource has been created for your course and you would like to collaborate with us, please email us at team@webstraw.ca

Meningitis

1. Pharmaceutical companies have long struggled to make a vaccine for a serotype B of which bacteria?

A. *Streptococcus pneumoniae*
B. *Streptococcus agalactiae*
C. *Haemophilus Influenzae type B*
D. *Neisseria meningitidis*

2. How does *S. agalactiae* cause diseases in newborns?

A. The infants eat food contaminated by *L. monocytogenes.*
B. Newborns reside in densely populated areas that have a high chance of spreading bacteria that causes meningitis.
C. The bacteria gets passed onto newborns when they are delivered through the birth canal.
D. Infants naturally have this bacteria, but sometimes meningitis can follow after an ear infection or sinusitis .

Staphylococcus

3. Which of the following statement(s) are true of *Staphylococcus epidermidis*?

A. They are a common colonizer of dogs and other animals.
B. They produce biofilms, especially on medical devices such as catheters.
C. They produce a polysaccharide capsule.
D. Both b) and c)
E. All of a), b) and c)

4. Which of the following is NOT a local infection associated with *Staphylococcus aureus*?

A. Osteomyelitis
B. Style
C. Non-bullous impetigo
D. Carbuncles

Streptococcus

5. Which best describes the characteristics of *S. pyogenes* bacteria?

1. Dependent on MHCCI to fully infect host organisms via superantigen activity.
2. Is the most significant source of death and healthcare burden around the world.
3. Will fully lyse blood cells when plated in agar.
4. Can cause illness and complications weeks after initial infection is cleared.

A. 1 and 3 only
B. 2 and 4 only
C. 1, 2, 3 only
D. 4 only
E. None of the above

6. Which correctly identify similarities and differences between *S. aureus and S. pyogenes*?

1. Only *S. pyogenes* is dependent on healthy T-cell populations to fully infect a host.
2. Both can destroy all immune responses to cause TSS.
3. Only *S. pyogenes* has shown complete susceptibility to lactams.
4. The root of "pyogenes" naming originates in its golden colour when viewed under a microscope.

A. 1 and 3 only
B. 2 and 4 only
C. 1, 2, 3 only
D. 4 only
E. None of the above

Borrelia burgdorferi

7. Which of the following are true about *B. burgdorferi*?

1. It is a gram-positive coccus-shaped bacteria.
2. Has a periplasmic flagellum that allows for adhesion to blood vessels.
3. One of its natural reservoirs is the *Ixodes* species.
4. Contains no lipopolysaccharide.

A. 1 and 3 only
B. 2 and 4 only
C. 1, 2, 3 only
D. 4 only
E. None of the above

8. Which of the following statements correctly identifies Lyme disease?

1. Many of the early cases of lyme disease were misdiagnosed as rheumatoid arthritis.
2. It is characterized by a bulls eye rash around the legs only.
3. Lyme disease may cause Bell's palsy.
4. Treatment of lyme disease does not involve antibiotics as the bacteria is resistant to them.

A. 1 and 3 only
B. 2 and 4 only
C. 1, 2, 3 only
D. 4 only
E. None of the above

9. Which statement is true regarding the transmission or infection cycle of *Borrelia burgdorferi*?

A. Transmission of *B. burgdorferi* occurs within the first 24 hours.
B. Nymphs and adult ticks are the only ones able to transmit the disease to hosts.
C. Ticks are great vectors as their saliva helps to decrease macrophage activity at the site of infection.
D. Since the tick initially sucks blood to become enlarged, it is advised to pick them off using tweezers at the tick's abdomen region.

Antibiotics

10. Which of the following is NOT a way that a bacterium can acquire antibiotic resistance?

A. Acquiring resistance genes from its host's cells .
B. On its own through evolution.
C. Resistance genes from the environment.
D. Exchanging DNA with another bacterium.

11. The minimal-inhibitory concentration (MIC) for antibiotics:

A. It is not an important factor when prescribing an antibiotic.
B. The higher the MIC, the more susceptible the bacteria is to the antibiotic.
C. Cannot be easily calculated by growing bacteria in a single concentration of antibiotic.
D. Is defined as the highest concentration of antibiotic that inhibits growth of the bacteria.

Mycobacteria

12. Which of the following is false about leprosy?

A. It can lead to a loss of sensation that often occurs on the skin and extremities.
B. It may take longer than 5 years to develop in susceptible individuals.
C. Most individuals who are exposed do not develop leprosy.
D. The bacteria responsible directly causes nerve damage through the release of exotoxins.

13. Which of the following is true regarding tuberculosis?

A. It is an infection of only the lungs.
B. The cause of the infection is well stained by Gram stain.
C. The cell envelope contains large amounts of mycolic acids.
D. It is a viral infection.

Answer Key

1. D

Neisseria meningitidis serogroup B is different from the other serogroups. Serogroup B has a capsule, cell-mediated vaccine development is difficult for capsules as capsules do not have protein antigens that can be used to stimulate the immune system.

2. C

S, agalactiae is a bacteria that is native in the urogenital tracts of many women, when the baby is given birth, it can pass through the birth canal that is in proximity to the female urethra. The bacteria can contact the infant and infect them during the delivery.

3. D

S. epidermidis are not common colonizers of dogs; that is *S. pseudintermedius*.

4. A

Osteomyelitis is a systemic infection from *S. aureus*, not local.

5. D

1 is wrong since MHC II activation of T-cells has been shown to maximize the infection of hosts, not MHC I. 2. According to the chart presented, GAS (500 000 deaths per year) is not the most significant burden of death globally. HIV/AIDS is the largest contributor. 3 is wrong since *S. pyogenes* is a beta hemolytic bacteria, and will only partially lyse blood cells in agar.

6. A

1 is correct, *Staph. aureus* does not use resident T cells as a mechanism to boost infection. 2. Both can cause TSS using superantigens, which triggers an overreaction by the immune system to cause symptoms, the immune system is not eliminated. 3 is correct from the lecture. 4 is incorrect since “aureus” fits that description.

7. D

Borrelia burgdorferi is a Gram-negative spirochete bacteria that is unique in that it does not have an LPS coat. It contains a periplasmic flagella that is used for motion and has lipoproteins that are involved in its adhesion process. Its natural reservoirs are white-footed mice, squirrels, and birds and uses the *Ixodes* species as vectors for transmission.

8. A

Many of the first cases of Lyme disease were misdiagnosed as arthritis, as one of its long term symptoms is joint swelling. However, a prominent symptom of Lyme disease is a bulls eye rash around the site of infection, which does not necessarily need to be on the leg. Another symptom of lyme disease is Bell's palsy, which is weakness in the face muscles. Finally, treatment does involve the use of antibiotics, but only in cases of chronic lyme disease, antibiotics have shown to be not useful.

9. B

Transmission of *B. burgdorferi* does not occur in the first 24 hours, occurs later on. Ticks are great vectors as their saliva helps decrease dendritic cell function. Since the tick gets enlarged from sucking the blood and then regurgitating it to infect the host with the bacteria as a result, it would best off not plucking them off near the abdomen region. It is best to pick them off near the head region. Finally, nymphs and adults are the only ones that are able to transmit the disease, not larvae.

10. A

Bacteria can acquire resistance genes from other bacteria and the environment, or mutations in their own genome can result in resistance genes. However, they will not acquire these genes from the host cells.

11. C

The MIC is important to consider when prescribing an antibiotic because we want the prescribed antibiotic dose to kill all the bacteria. If the MIC is lower, that means the bacteria is more susceptible to the antibiotic because they are all killed at lower doses. The bacteria needs to be treated with different concentrations of antibiotics to determine the MIC. The MIC is the lowest concentration of antibiotic that inhibits bacterial growth.

12. D

The first three statements are true. The last statement is false because exotoxins are not part of the pathogenesis of the disease.

13. C

There is a type of tuberculosis that is extrapulmonary and occurs outside the lungs. It is caused by a mycobacteria that is Gram-positive but not stained well by Gram stain. The cell envelope is unusual with large amounts of mycolic acids.