Microbiology 2730
Study Guide #9
Winter Semester 2008
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LABORATORY SECTION

OXYGEN AND BACTERIAL GROWTH

You should read the introductory material presented in your laboratory manual
The Textbook Reference for this set of questions is Chapter 6

1. As was noted in class, the world of bacteria can be subdivided into at least 3 major groups, based on their need for oxygen. What are these groups? You should be able to define each, in terms of their oxygen requirements.

2. In addition to the groups mentioned above, you textbook indicates several other groups, one of which is that known as the microaerophiles. You should be able to distinguish this group from the others.

3. You should be able to cite 1 example of a bacterial species that is capable of causing human disease and is an obligate anaerobic organism. Cite the disease that it causes.

4. 2 general means for obtaining anaerobic environments were mentioned in class. What were those approaches?

5. You were introduced to 2 chemical methods for obtaining anaerobic environments. What were they? You should be able to briefly describe each of these methods

6. The "anaerobic jar" set up creates not only an anaerobic environment but one which is rich in carbon dioxide. Of what general benefit is this to the medical microbiologist?

7. What is the function of the dye, resazurin, in media such as fluid thioglycollate medium?

8. What appears to be the effect of resazurin on the growth of *E. coli?*

9. In discussing the chemistry of why bacterial organisms may be obligate anaerobes, you were introduced to superoxide dismutase. What does this enzyme do? What is superoxide? What cellular process generates this material? One explanation for the existence of the obligate anaerobic bacterium is based on the absence of SOD (superoxide dismutase) describe the reasoning behind this explanation.

10. The tissues of the human body are essentially an aerobic (oxygen rich) envirobment. Puncture wounds can result in the development infections attributed to the presence of bacteria which are of the strict anaerobic type. Cite two factors resulting from puncture wounds which would help set up the necessary conditions for the growth of anaerobic bacteria in human tissue.

11. Your Textbook discusses a "candle jar".
    a. You should be able to describe this piece of equipment.
    b. What kind of environment is produced by its use?

THE STREAK PLATE

You should read the introductory material presented in your laboratory manual
The Textbook Reference for this set of questions is Chapter 6

1. What is this procedure used for in the microbiology laboratory?

2. Briefly describe how this procedure achieves its goal. You should also be able to describe how to a streak plate involving the pattern done in the laboratory

3. What is a "blow in"?

4. Cite one easy way to identify a potential "blow in".

5. What is generally meant by the term, pure culture?

6. What is generally meant by the term, isolated colony?

7. Cite 3 characteristics of bacterial colonies, which could be used to identify different colonies on a Petri plate.

8. Cite 2 actions that you could carry out to determine if a bacterial culture that had been grown on a nutrient agar slant, was in fact a pure culture.

9. Describe how Petri dishes should be incubated under most circumstances. Why is a Petri dish called by that name?

BACTERIAL GROWTH AND TEMPERATURE

You should read the introductory material presented in your laboratory manual
The Textbook Reference for this set of questions is Chapter 4

1. Bacterial organisms can be grouped into 3 different classes on the basis of their optimal growth temperatures. What are those classes? Define each on the basis of optimal growth temperatures.

2. What are the 3 cardinal temperatures shown by each bacterial species? Define each of these temperatures.

3. When you say a bacterial culture is growing, what does this imply about the culture?

4. Cite 1 explanation for the existence of thermophilic bacteria.

5. Cite 1 explanation for the existence of psychrophilic bacteria.

6. What are thermoduric bacteria?

7. Cite 2 natural environments where you would expect to find psychrophilic bacteria. In what industry would you expect psychrophilic bacteria to play a significant role?

8. Cite 2 natural environments where you would expect to find thermophilic bacteria.

9. Bacterial organisms that are capable of growing in and causing "problems" in the human body would be placed into which of the above- mentioned classes?

DIFFERENTIAL, SELECTIVE, AND ENRICHED MEDIA

You should read the introductory material presented in your laboratory manual

Note: See handout for additional information concerning this exercise.
Note: chapter 4 of your textbook should provide additional information concerning media.

1. Define each of the following media types.
    a. Differential medium

b. Selective medium
c. Enriched medium

You should be able to cite 1 specific example of each of the above mentioned media types.

2. Eosin Methylene Blue Agar (EMB agar) has a number of uses in the microbiology laboratory. One of its most famous uses is in the identification of what specific bacterial organism? What is the outstanding characteristic that this organism exhibits when grown on EMB agar?

3. Both EMB and MacConkey's agar can be used to suppress the growth of Gram ___ bacteria. What component of the medium is involved in their above mentioned action?

4. Mannitol Salt agar is a medium, which is rather widely employed in the cultivation of which medically important genus?

5. What component of Mannitol Salt agar selects for the above-mentioned genus?

6. What was the reference book cited in class as a good source of information concerning the use and composition of microbiological growth media?

7. What is the function of agar in a growth medium such as Nutrient agar? To what class of chemical substances does agar belong? (Lipids, proteins, etc.)

8. Blood agar is used to detect hemolytic reactions. What are the 3 classic types of hemolytic reactions? You should be able to describe each. What component of blood agar qualifies this medium as being an example of an enriched medium?

9. What are fastidious microbes? Generally, what type of growth media must be employed in their cultivation?

10. The ability of some bacteria to grow on Mannitol Salt Agar raises the issue of how these bacteria can survive and grow in an environment that is rather hypertonic to most bacterial species. What is the general approach that *Staphylococcus aureus* takes to allow it to handle the high salt concentration and still not suffer massive water loss?

LECTURE SECTION

Chapters 13 and 14

1. A short time was spent discussing the bird flu (influenza) virus. When reading about this virus, designations such as H5N1 are encountered. The H and N designations refer to specific ___ (lipids, proteins, etc.) that are found in the envelopes of these viruses. What do the H and N stand for? What do the numbers stand for?

2. Currently, almost all of the infections of living organisms due to H5N1 involve what kinds of living organisms?

3. At the present time, there have only been a handful of reported cases of "bird flu" among humans. The bulk of these cases have involved individuals who have worked closely with ___. Generally, of this infected group of people, what is the mortality rate?

4. What is the concern, at the present time, with "bird flu" for a public health standpoint?

5. Human influenza viruses are ___ (RNA or DNA) viruses and are different from the general diagram that you were introduced to in what major respect?

5. In the discussion of the HIV virus, it was noted that the virus is an RNA virus. Following the penetration phase and uncoating step, the viral RNA directs the synthesis of the corresponding DNA via the use of what enzyme? This DNA once formed can then insert itself into the ___ information of man, at which time it is referred to as a ___. This genetic information, if it becomes active, can then direct the synthesis of additional ___ particles.

6. In the course of the discussion of HIV, your attention was called to a class of compounds known as protease inhibitors. What is a protease? Why are protease inhibitors useful in attempting to prevent the replication of the virus in an infected cell?

7. In discussing cellular defenses against viruses, it was noted that alteration of the ___ of the cell would be one way for a cell to defend itself against viral invasion. Your attention was also called to a class of enzymes known as restriction endonucleases. These enzymes have the ability to detect and destroy ___.

8. Your attention was also called to a class of chemical messengers known as the interferons. This group of small proteins can act to alter cells to prepare to defend themselves against ___ invasion.

9. In discussing the effect of viruses on cells, several effects were noted. You should be able to briefly describe the following:

a. Lysis
b. Transformation
c. Flower break
    1. What happens here (use tulip as your example)
    2. This condition was used to illustrate what general effect of viruses on cells

d. Giant cells
    1. What happens here

10. What are viroids? At the present time, viroid based diseases are known to occur in ___.

11. You were introduced to 3 general approaches to cultivate viruses. What were those approaches?

12. The following information comes from my discussion of the so-called Central Dogma of Biology.

a. This idea holds that in normal circumstances, information flow in living organisms moves from ___ to ____ to protein.
b. It was noted that the process by which proteins are produced is normally divided into 2 sets of chemistry. One set of reactions involves the production of m or messenger RNA and is referred to as ____ while the second involves the linking of amino acids together to form proteins and is collectively referred to as ___.
c. The cellular part or subcellular organelle that is involved in the production of proteins is the ___.
d. Generally speaking "genes" are segments of ____ which control the production of genetic traits by actually controlling the production of ___ molecules in living cells.