Microbiology 2400
Study Guide #3
Winter Semester 2008
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LABORATORY SECTION

THE COMPOUND MICROSCOPE

1 A last question concerning your microscope. Beyond turning the light of your microscope on and off, there are 3 additional steps that you can take to adjust the light that enters into your microscope. What are those 3 approaches?

THE GRAM STAIN

1. When taking samples from the culture tubes in the laboratory as you prepare your stains such as the Gram stain, you utilize a procedure known as sterile technique. You should be able to describe this process in a stepwise fashion.

THE ACID FAST STAIN

Textbook reference for this set of questions is chapter 3
You should also read the introductory material presented in your laboratory manual.

1. As was pointed out in class, there are relatively few genera of bacteria, which are acid fast positive in nature. What genus did you work with in the laboratory that is characterized by being acid fast positive?

2. Cite 1 species found in the above-mentioned genus, which is capable of causing human disease.

3. If an acid-fast stain is successfully run on an acid fast positive bacterium, what color will it appear? Acid fast negative bacteria appear what color at the conclusion of the acid-fast procedure as carried out in our laboratory?

4. What is the major characteristic of the acid-fast bacteria that is responsible for the staining result obtained?

5. Some people contend that as many a ___ of the people on the earth may be infected with *M. tuberculosis* How does this bacterium rate in terms of bacteria which are known to kill people?

THE ENDOSPORE STAIN

Textbook reference for this set of questions is chapter 3
You should also read the introductory material presented in your laboratory manual.

1. What are the 2 major genera of bacteria capable of forming endospores?

2. Cite 4 characteristics of endospores that make them quite different from the vegetative form of the bacterium.

3. Under most circumstances, you would expect a vegetative cell to form how many endospores?

4. You must certainly take into account the possible presence of endospores if you were attempting to sterilize a material. Why is this so?

5. You should be able to describe the following structures after the successful application of the endospores staining procedure used in you laboratory.
    a. Vegetative cells
    b. Free spores
    c. Spores within a "sporangium"

6. What is meant by the term, vegetative cell, in the context of spore forming bacteria?

7. What would be the single best reference book to look at, to determine if *Bacillus subtilis* has subterminal spores

LECTURE SECTION

Chapter 1

Note: For additional information on viruses and prions see chapter 13. For additional on eukaryotic microbes (algae, etc) see chapter 12. For additional information on Domains, see chapter 10. Chapter 27 will provide information concerning sewage treatment as it was discussed in class.

1. You were introduced to several different reasons to pay attention to microorganisms.

   a. One reason involved a microbe whose name is *Phytophtora infestans*. This microbe is responsible for what condition? This microbe caused a large number of deaths and emigration from Ireland in the late 1840s. Why did this happen?

   b. You were introduced to the idea of bioconversion. What does this term imply? Provide an example of a bioconversion process.

   c. As was noted in class, biotechnology has enhanced the range of possible bioconversions. You were introduced to the example of taking the human gene for ____ production and inserting it into ____ (name of microbe). This allows the conversion of relatively cheap ____ food into a much higher value product.

   d. Sauerkraut production was cited as an example of using microorganisms to produce human ____.

   e. Another major reason for understanding the care and feeding of microorganisms that was mentioned in class, involved environmental cleanup. Under this heading you were introduced to the notion of secondary sewage treatment. This phase of modern sewage treatment in directed towards the removal of BOD materials from sewages. What does this acronym stand for? What kinds of chemicals constitute BODs? Generally speaking, what environmental problem is associated with the presence of BOD materials in water environments? Describe the origin of this problem? In large metropolitan areas, secondary treatment normally uses the activated sludge approach. What is activated sludge? How does this material remove the BOD materials? For additional information concerning sewage treatment (beyond that found in your lecture notes, please see the index of your textbook for page references.)

   f. Cite one other use or reason for understanding microorganisms. Note: please do not ask me about this question. Let us see what you can do on your own.

3. You were very briefly introduced to the major groups of "microbes" that are currently recognized. These were the "bacteria", fungi, algae, protozoans, "worms", viruses, and prions. In describing these groups, the terms heterotrophs and autotrophs were introduced. What is meant by each of these terms? Three terms were used to describe the size range of the microbes in each of the above groups. What were those terms? Define each of these terms.

4. You should be able to describe the size range of the each of the above-mentioned microbial groups and their nutritional status (autotroph or heterotroph).

5. A brief amount of time was spent discussing viruses and prions.
    a. You should be able to describe a typical viral organism with the use of a labeled diagram.
    b. The chemical nature of the viral genome is different from other forms of life in that it can be either ___ or ___,
    c. Viruses have been described by some, as being the ultimate parasite since they can not even reproduce on their own but rather require the presence of a living host ___ to supply them with the needed "machinery" to allow them to fashion their "parts and pieces"

6. Prions are a rather new class of disease causing objects. Current research indicates that prions are really inaccurately folded ___molecules. Theory contends that these prion molecules can bring normal molecules over to "their side (the nonfunctional side) if they come into ___ with them.

7. Known animal diseases associated with prions involve conditions that lead to the destruction of cells in what system of the animal's body? Recently, there has arisen evidence that prion proteins may also be found in another type of animal tissue. What is that tissue?

9. A few brief comments were directed to a condition known as chronic wasting disease. This condition is found in what kinds of animals? Currently there have been ___ (no or some) cases of this condition found in the State of Michigan.

9. Probably the most famous condition attributed to prions is that of Mad Cow Disease. In the case of this condition we now know that this prion condition can jump the species barrier and enter into us humans. This fact has come to light primarily as a result of the situation involving the problem in what country?

10. This question is going to requires that you make use of your textbook. Housed within the genus, *Treponema* is a bacterium whose scientific name is *Treponema pallidum*. Note, when attempting to get the answers to the following questions, you would be advised to look in the index of your text under the headings of *Treponema pallidum* and Koch's postulates.
    a. This bacterium is the causative agent of what very famous human disease?
    b. A careful reading of your textbook, will indicate that it is technically impossible to apply Koch's postulates, when trying to link it to the disease that it causes in humans. Why?