

**Microbiology 2400  
Study Guide #4  
Winter Semester 2008  
E. Hoffman**

## **LABORATORY SECTION**

### **THE NEGATIVE STAIN**

**Textbook reference for this set of questions is chapter 3  
See Dark Field Microscopy and Negative Staining  
You should also read the introductory material presented in your laboratory  
manual**

1. This staining technique has its prime use in determining what characteristics of the bacterial cell?
2. What “step” has been eliminated from this staining procedure that was done in the other procedures that you have conducted in the laboratory? Why is the elimination of this step important considering the use that this procedure is put to?
3. The negative staining procedure can be replaced by the use of what type of microscope?

### **THE HANGING DROP TECHNIQUE**

**Note: there are no suitable textbook references. You will have to use  
your laboratory manual as the sole source of information along with my  
comments.  
You should also read the introductory material presented in your laboratory  
manual**

1. This technique is utilized to determine what characteristic of the bacterial cell?
2. What is the most commonly encountered technique utilized by bacterial cells to achieve motility?
3. What characteristic of the above mentioned organelle makes them almost impossible to see with the light microscope?
4. Flagellum staining is unlike the procedures that you have conducted up to this point in the semester. What makes this procedure different?

5. What do you actually do when you “stain” a bacterial flagellum?
6. What is Brownian motion? What characteristic of the bacterial cell makes them able to exhibit this phenomenon?
7. Cite one other reason that bacterial organisms may appear to “move” when viewed in a “wet mount” preparation, in addition to flagella generated motion?
8. A few comments were made in reference to the anatomy of the bacterial flagellum. This organelle is anchored into the \_\_\_ by a rather elaborate basal body. The motion of the organelle is generated via a mechanism that actually does not make use of ATP but rather derives its energy from the inward movement of \_\_\_ that occurs through channels in some of the membrane proteins that make up the basal body. Are bacterial flagella variant or invariant structures? Flagella are constructed primarily from what class of chemical substances? (lipid, carbohydrates, proteins, etc)?

## **THE FUNGI**

1. During the course of the laboratory, you had the opportunity to view several different species of fungi. One of those fungi has been given the scientific name of *Penicillium chrysogenum*. This particular fungus has proven to be very important to medical science for what reason?
2. The other fungal organism that you had the opportunity to view was that of *Rhizopus stolonifer*. This particular fungus is identified as being one of the common black molds that grow on \_\_\_\_, a common household item.
3. The slide materials associated with the fungal demonstrations allowed you to view cells and structures that are associated with the process of \_\_\_ (sexual or asexual) reproduction in these molds.
4. In my very brief comments on fungal anatomy I noted two terms, mycelium and hypha. You should be able to relate these to the molds that you had the opportunity to view on demonstration.

## LECTURE SECTION

1. Some time was spent discussing the ramifications of the very small size of bacterial cells. Their small size insures that they will be endowed with a \_\_\_\_\_ surface area to volume ratio. A large surface area to volume ratio lays the foundation to support a very high \_\_\_ rate, which in turn makes it possible for bacterial cells to exhibit a very high \_\_\_ rate. Generally speaking, the dimensions of bacterial cells are given in what metric unit?
2. Just about the time that one seems to have it all figured out, the exception to the rule occurs. In this regard, your textbook introduces you to two rather unusual bacteria, one has the scientific name of *Epulopiscium fishelsoni* (Page 330) and the other goes by the name of *Thiomargarita namibiensis* (Page 340). What is the major claim to fame of these two microbes of the purposes of this course at this time?
3. What are the 3 principle shapes for bacterial cells to assume? Some bacterial species are described as being monomorphic in nature while others are noted to be pleomorphic in nature. What do each of these terms refer to?
4. You should be able to describe the following cell associations:
  - a. Streptococcal
  - b. Staphylococcal
  - c. Sarcinia
  - d. Streptobacillus
5. There are other cell shapes than those that were noted in lecture. Your textbook indicates some of them to you in chapter 4. You should be able to cite one such additional shape.
6. It was noted in class that many structures associated with bacterial cells are variant in nature. What does this mean? You were introduced to 5 different reasons for the existence of variant structures. What were those reasons?
7. One of those reasons was termed quorum sensing. This is a phenomenon in which the \_\_\_ density of a population of bacterial organisms can serve to trigger \_\_\_.
8. As part of the discussion of why a bacterial cell structure would be variant in nature, you were introduced to a bacterium whose scientific name is *Streptococcus mutans*. This bacterium is a central player in a “health problem” that many of us humans have experienced of the years. What is this problem? What variant bacterial structure was noted in this example? What controls the presence or absence of this structure in the bacterium? Why is the presence of this structure important in the generation of this health problem? See page 747 in your textbook for help with this question.
9. What are “invariant structures” in bacterial cells? Three such structures were cited in class. What were they?

10. If you were a molecule and wished to move from the environment surrounding a bacterial cell to its cytoplasm, what 3 structures would you have to negotiate in order to achieve that end in most bacterial cells? What is the order in which you would cross these structures?
11. The outer surface of many bacterial cells consists of a layer of material that is usually referred as the glycocalyx. The chemical nature of this material usually takes the form of \_\_\_\_ (lipid, protein, etc). Any number of microbiologists have chosen to subdivide the glycocalyx into two major types. What are they? What is the prime difference between these types?
12. You should be able to cite 2 possible functions for the glycocalyx of the bacterial cell (Note: see your lecture notes or textbook).