Study Guide
MICROBIAL DIVERSITY
Brock Ch. 12, V through the end

This study guide covers Brock Ch. 12, parts V through XV: the remaining phyla of bacteria. **This material will be covered on EXAM 2.**

We'll start in the 'seven phyla' group, as defined in class.

A. The Chlamydias

1. What are the three main characteristics of the Chlamydias?

2. Are they Gram-positive or Gram-negative? (circle one)
3. List two diseases caused by *Chlamydia* species.

4. Use the space below to clearly distinguish among a virus, a *Rickettsia,* and a *Chlamydia.* You don't have to list everything in Table 12.34; instead, provide four pieces of evidence that will clearly distinguish among these three microbes.

5. List and define the two cellular types that characterize *Chlamydia* species.

B. Planctomyces

1. List three differences between *Planctomyces* and *Caulobacter.*

2. (In case you did not list it above…) – name one feature that distinguishes *Planctomyces* from most bacteria. What other group of bacteria shares this trait?

3. Describe one of the most distinctive features of *Planctomyces* cells, using *Gemmata* as an example.

C. Verrucomicrobia

1. What do members of this phylum share with some proteobacteria? (List three characteristics)

2. To what does the name of this phylum refer?

D. The Flavobacteria, or Bacteroidetes

The two key genera in this phylum are *Flavobacteria* and *Bacteroides.*

1. What's the claim to fame of *Bacteroides?*

2. (From class) Note that some *Flavobacteria* form symbioses with cockroaches and other insects.

3. Note as well that members of this phylum include the bacterium *Cardinium*, which is a reproductive manipulator of its insect hosts (as per M. Hunter's lecture).

E. Cytophaga

1. What is distinctive about the 'feeding' habits of *Cytophaga* relative to other bacteria? What medium could you use to isolate these bacteria relative to others?

2. How are *Cytophaga* species important to fish farming, and what is the mechanism of their effect on fishes?

F. Green sulfur bacteria

1. Green sulfur bacteria were covered in detail in the table on the last study guide (question 1). I'd like you to remember the following characteristics of green sulfur bacteria:
    a. Not closely related to purple sulfur bacteria
    b. Use H_2S as an electron donor, but store sulfur outside of the cell
    c. Anoxygenic phototrophs
    d. Non-motile, although some species use gas vesicles to regulate buoyancy
    e. Most species are capable of photoheterotrophy.
    f. Because of highly efficient photosystems, they can grow at **very** low light.
    g. Have chl *a* and *c, d,* or *e.*
    h. Are unique in possessing **chlorosomes**, which are… (Define here)

    i. Often are found in **consortia** (define/describe here)

i. Note that epibionts and central cells often divide in synchrony, suggesting that they communicate with each other.

G. Defferibacter

Defferibacter is described briefly at the end of the chapter. This is a member of the 'seven phyla', but we don't know much about it. They are versatile at anaerobic respiration and use a variety of electron donors, including iron.

Now, we'll step outside of the 'seven phyla' and will work our way down the tree.

H. Spirochetes

1. Describe the morphology and Gram-stain characteristics of spirochetes.

2. How would you distinguish between a *Spirillum* and a spirochete? (State three ways)

3. The flagellar apparatus of spirochetes is made up of **endoflagella.** (From class notes, draw a spirochete in cross section and be sure that you can describe the endoflagellar system in words.)

4. What diseases are caused by *Borrelia burgdoferi* and *Treponema pallidum*?

5. What is distinctive about the chromosome of *Borrelia*?

I. Deinococci

The two key genera in this group are *Thermus* and *Deinococcus*.

1. What major product of *Thermus* has reshaped molecular biology?

2. What unique cell wall component do *Thermus* and *Deinococcus* share?

3. *Deinococcus radiodurans* is incredibly radiation-resistant. Enzymes in this organism are capable of two methods for repairing radiation damage:

   However, this organism is susceptible to mutagens that cause _____.

J. The green non-sulfur bacteria.

The key genus in this group is *Chloroflexus*.

1. What aspect of the lifestyle of the green non-sulfur bacteria is shared among all of the early-diverging lineages of bacteria?

2. We didn't mention this in class – but what is distinctive about the membrane lipids of the GNSB?

3. What is special about the cell wall of the GNSB – just like *Planctomyces*?

4. Are GNSB capable of photoheterotrophy? _____

5. Do they produce oxygen from photosynthesis? _____.

6. Note that GNSB represent the earliest evolution of photosynthesis! (They are the first lineage on the tree to arise that was capable of photosynthesis – see bacterial phylogeny from class.)

K. The early-diverging, hyperthermophilic bacteria

The two key genera in these ancient lineages of bacteria are *Thermotoga* and *Aquifex.* These early lineages are hyperthermophiles.

1. *Thermotoga*, which have a unique 'sheath' around the cell, are Gram-_____.

They are anaerobic/aerobic (choose one), are capable/not capable of fermentation (choose one), and they make a living by _____.

2. *Aquifex* is the _____ to the rest of bacteria. It is the most ancient lineage, and is characterized by the most extreme hyperthermophilic growth in the domain Bacteria. Like some archaea, *Aquifex* is an _____ hyperthermophile.