

Exam will cover Chapters 10, 15, 16, and 19. The assigned internet readings and the handout on Adaptive Immunity.

Exam will also cover student organisms presented to date. Know information from summary sheets.

### **Pneumonia**

1. Know the basic characteristics of *Streptococcus pneumoniae*.
2. Know what kind of pneumonia is caused by *S. pneumoniae*. Know other diseases directly caused by *S. pneumoniae* and the diseases that can develop as complications of streptococcal pneumonia.
3. Understand what actually occurs in pneumonia (what actually causes the symptoms). Have a general understanding of the kinds of organisms that cause pneumonia in children versus adults.
4. Know what kind of pneumonia is caused by *Streptococcus pneumoniae*. Know what the difference is in infective doses between a person that is healthy and a person who has a weakened immune system or who has another infection that has already initiated inflammation. Know the symptoms of pneumonia caused by *Streptococcus pneumoniae*.
5. Are *Streptococcus pneumoniae* usually invasive pathogens? Know the process by which pneumococci can invade endothelial cells during severe pneumonia. What process is used to take the bacteria into the endothelial cells?
6. Why does bacteremia increase the chances of meningitis?
7. Understand the cell wall structure of *S. pneumonia* and know what has been added to the teichoic and lipoteichoic acids in the cell wall in this organism. Know the importance of choline in the pathogenesis of *S. pneumonia*.
8. Understand what components of *S. pneumoniae* act to initiate inflammation and what pathways are actually activated.
9. Understand what a capsule is. Understand how “strains” of *S. pneumoniae* differ from each other.
10. Understand how the capsule of *S. pneumonia* prevents phagocytosis.
11. Understand how pneumonia is resolved and why antibody directed against capsule polysaccharides allows phagocytosis of *S. pneumonia*. Does pneumonia caused by *S. pneumoniae* have long-lasting effects on the lung? Why?
12. Understand what the preferred treatment for *S. pneumonia* was in the past and why this treatment is no longer effective in many cases.

### **Spread of Microbes in the Body**

1. Understand the difference between a localized infection and a systemic infection. Understand some reasons why pathogens cause systemic infections. Understand how the rate of replication can be related to whether or not a microorganism will cause a systemic infection.
2. Understand where a pathogen that has entered the tissues usually goes first as it is spreading through the host. What factors affect how successful regional lymph nodes will be in filtering out pathogens.
3. What factors affect whether a pathogen will be able to survive in the blood stream?
4. Do pathogens always go directly to their final destination (place where the signs and symptoms of disease occur) immediately as they spread through the body? What stage of disease is occurring during this process. Is the disease contagious during this time?
5. What are some of the theories about how pathogens target specific organs for localization from the blood stream?
6. Understand the ways that organisms can spread to infect the nervous system. Is the spread always through nerve fibers?
7. Know some of the alternate pathways organisms can use to spread in the body.

### **Immune Responses**

1. Know the characteristics of an immune response. Know why it occurs. What is a primary response? A secondary response?
2. Know what an antigen and an epitope are and know what classes of macromolecules usually make good antigens. Does each pathogen only have a single antigen? What is protective immunity?
3. What are the 2 arms of the immune response? What type of pathogen is each arm designed to control.
4. Know the cell types involved in mounting an immune response, know what each cell type is responsible for. Have a general understanding of how each cell type recognizes specific antigens. What are antigen presenting cells? Know what they do.
5. Know the basic structure of an antibody, the different classes (types) of antibody important in immunity, their structures, and their general characteristics.
6. Understand how antibodies actually work to prevent disease (how can they interact with pathogens). Are antibodies effective in controlling intracellular or extracellular pathogens? Can antibodies alone actually kill pathogenic microorganisms? What is responsible for the “actual” killing?
7. Know what cells are involved in cell-mediated immunity and the type of pathogens cell mediated immunity is designed to control. Know the function of a cytotoxic T cell and a helper T cell in inducing cell-mediated immunity.

8. After activation, where do different types of lymphocytes localize within the body?

### **Tuberculosis**

1. What was the “White Plague”? How prevalent was TB at that time? What is the tuberculin skin test? What does it determine?
2. How prevalent is TB today (worldwide). What immunocompromised population is extremely susceptible to TB?
3. Know the cellular characteristics and growth requirements for *M. tuberculosis*.
4. Know what properties the high lipid content of the cell wall of *M. tuberculosis* gives to the bacterium.
5. Be able to list 3 virulence factors of *M. tuberculosis*.
6. What is the infective dose for *M. tuberculosis*? Is it very contagious? How is it spread? Is it stable in the environment?
7. Know the signs and symptoms of TB and how TB disease is diagnosed. Know the difference between TB infection and TB disease.
8. Understand the steps in the progression of TB disease. When does the person infected with *Mycobacterium tuberculosis* develop a positive result for a tuberculin skin test.
9. What kind of immunity is necessary to stop the progression of TB? What cytokine is important in controlling TB. What does it do? Are antibodies effective in controlling TB? Why or why not?
10. Are all of the effects of cell-mediated immunity positive? What is a tubercle (granuloma)?
11. Do all people infected with TB develop tuberculosis? What is responsible for halting the development of disease? Is *Mycobacterium tuberculosis* completely eliminated from the body? When can reactivation of TB occur?
12. Have a general understanding of the treatment for TB and why multi-drug resistant strains of TB are developing.
13. Is a vaccine available to prevent clinical TB? What is it? Why is it not used in the US?

### **Microbial Evasion of the Immune Response**

1. Know the various mechanisms pathogens have developed to evade the immune response.
2. Know what a “hit and run” strategy is. Understand why can you get diseases caused by organisms using a hit and run strategy over and over again. Why doesn’t protective immunity develop? Know some examples of organisms that use a hit and run strategy.
3. Know the various ways organisms have developed to conceal their antigens.

4. Know what immunological tolerance is. Understand the difference between natural and induced tolerance.
5. Know the different ways that pathogens can use to induce tolerance.
6. Know what immunosuppression is. Know how pathogens can induce immunosuppression.
7. Know what antigenic variation is and the mechanisms involved in generating antigenic variation. Understand why the antigen that varies must be an antigen that induces protective immunity.
8. Understand antigenic variation occurring due to DNA recombination. Understand how *Borrelia recurrentis* causes relapsing fever.