

Introduction: significance of infectious disease; microbes; defenses

1. Using the information presented in class to support your answer, explain the significance of infectious disease from personal, national, and global perspectives.
2. Define the terms “microbe”, “host”, “pathogen”, “infection”, “disease”, and “infectious disease.” Write one clear sentence in which each is correctly used.
3. Explain why I used a picture of a resort to discuss the relationship between microbes and the human body (hint: your answer should explain what the relationship is!). How many species of microbes live in or on our bodies? What is the ecological relationship between us and our “normal” microbes? Use specific examples in your answer.
4. Explain the statement that “under normal circumstances, our microbes act as a relatively stable ecological community.” Your answer should include the ecological factors keeping the community stable.
5. Under what circumstances can our normal microbes cause disease? Be as specific as possible.
6. List and describe the 3 major categories of microbes. Give as many examples as possible of diseases caused by each.
7. Compare and contrast acute, chronic, and latent infections and give at least one example of each.
8. List and discuss the 3 major ways pathogens cause disease symptoms. Give at least one example of each.
9. Why, from an evolutionary perspective, must pathogens have dispersal mechanisms? What is the relationship between pathogen dispersal and disease symptoms?
10. Defend the statement that we and our microbial pathogens are locked into an evolutionary arms race. Your answer should clearly explain what an evolutionary arms race is!
11. Describe, in general terms, the two major classes of defenses against pathogens and list the components of each.
12. List the major physical and chemical (non-specific) defenses against pathogens. For each, give a detailed description of how it works and what, if any, weaknesses it has (i.e., how pathogens may be able to evade it). Why do the respiratory, digestive, and urogenital tracts, in particular, need strong defenses?

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13. List and describe the specialized cells and proteins that are part of our generalized defenses against pathogens. In what way(s) can microbes evade these defenses?
14. Describe the steps of the inflammatory process. When is this process initiated? What, specifically, causes the redness, swelling, and heat associated with inflammation? What can happen if the inflammatory response becomes widespread?
15. What is a fever, and how does a moderate fever help fight infection? Why is high fever dangerous?
16. To what organ system(s) does the lymphatic system belong? Is it part of general defenses, specific defenses, or both? Justify your answer.
17. Describe the anatomy of the lymphatic system, being sure to define the terms “lymph”, “lymphatic vessels”, and “lymph nodes”. In your answer, be sure to include the general function of each of the components of the system.
18. Describe the role of the lymphatic system in circulation. How does this relate to its role in the body’s defense?
19. In what ways does the lymphatic system aid in the body’s general defenses? Why do lymph nodes swell when we get sick?
20. In what general ways do specific defenses differ from non-specific defenses?
21. Explain why distinguishing “self” from “non-self” is a critical ability of the immune system. What, exactly, identifies a cell as “self” or “non-self”?
22. What is the technical term for “non-self” proteins? Where are they found? If these proteins identify harmful microbes to the immune system, why do microbes have them?
23. Describe how/where the immune system finds antigens. What are macrophages, and what role do they play in this process?
24. Compare and contrast B and T lymphocytes in terms of their site of origin, site of maturation, general function, and types of antigens.
25. Describe the process of clonal selection. In what kinds of lymphocytes does this process occur?
26. Describe how B and T lymphocytes work together to fight microbial infections. Be sure your answer includes a discussion of where the process begins and the specific roles of each type of lymphocyte.

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27. What is “immunological memory” and what function does it serve? In your answer, discuss the primary and secondary immune responses and explain how clonal selection is involved.
28. Describe how the process of vaccination takes advantage of immunological memory. Explain how you would correct a friend who told you he or she didn’t want to get a flu shot because “getting a flu vaccination gives you the flu”.
29. Why can’t we develop effective vaccines against more kinds of microbes? Specifically, what characteristics of microbes make them poor candidates for vaccinations? What characteristics would make a microbe a good target? (Hint: I told you one part of this in lecture that is not in your notes!)
30. Explain the general cause of autoimmune diseases and give examples to illustrate the range of body systems that may be affected. In general, what causes the symptoms of an autoimmune disorder?
31. Can autoimmune disorders be cured? If not, how are they treated?
32. What is an allergy? What is an allergen? Give examples of different kinds of allergens and list the major body systems that usually respond to them.
33. Describe the two stages of an allergic response. Be sure to clearly explain the nature and roles of antibodies, mast cells, and histamines.
34. Under what conditions can allergic responses be deadly? Describe anaphylactic shock and explain how it is treated.
35. Explain how allergies may be treated by describing the actions of antihistamines and allergy shots.

Treatment & prevention, with historical perspective

1. Give a basic timeline of the bubonic plague in 14th century Europe. What were the presumed causes? How were these causes addressed?
2. Outline the major landmarks in the development of modern medicine, including names and dates as appropriate. Who discovered the cause of bubonic plague?
3. Describe what we now know about the transmission and effects of the bubonic plague. Include a brief comparison of the two forms of the plague. Which is the most dangerous? Have we “defeated” plague? Defend your answer.
4. Describe how Jenner tested his ideas about vaccination in the late 18th century.

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Describe how vaccines are made today and briefly explain how they work.

5. Discuss the issue of compulsory vaccination for schoolchildren. Why is vaccination beneficial? Why are some individuals unable to be vaccinated? Why do others object to the procedure? Describe how “herd immunity” works and explain whether or not lack of vaccination compliance has caused a loss of herd immunity in the U.S. What are the major questions we need to resolve about compulsory vaccination? As a citizen, parent, or future parent, where do you stand on this issue?
6. What is the most important preventative measure you can take against infectious disease? Explain.
7. Is food-borne illness a serious concern in the U.S.? Explain. List and describe the four major steps you can take to prevent food-borne illness. Be as specific as possible.
8. What are antibiotics and how do they treat the cause of bacterial disease? What are the primary sources of antibiotic chemicals and what role do they play in natural communities?
9. What is the major role of antibiotics in an infected individual? Why is it important to complete the full course of prescribed antibiotics? What major steps can we take to reduce the incidence of antibiotic resistance?
10. Why are anti-viral drugs not as common as antibiotics?
11. Describe the source(s) of other kinds of medicines. Outline the process by which a new drug is brought to market. How is/will the loss of native cultures and biodiversity affect this process?
12. Compare and contrast how the FDA regulates drugs and nutritional supplements.

Sexually transmitted infections

1. From what was the term “venereal disease” derived? Why is the term “sexually transmitted infection” more appropriate than “sexually transmitted disease”?
2. Describe the scope of the STI problem in terms of the numbers of people affected, trends in infection rates, and demographics (who is most at risk). Discuss the cost – economic and other – of STI’s in the U.S. Use data to support your discussion.
3. How many STI agents have been identified? What are the “top 3”, and on what basis is this designation made? List the 8 major STI agents (being sure to identify the group of microbes to which each belongs), the diseases they cause, and the special characteristics of each we discussed in class.

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4. Describe the anatomy and basic physiology of the male and female reproductive systems; practice identifying all anatomical features discussed in class on representative diagrams. For each anatomical feature, list the STI agents that may infect it.
5. What STI risks do males and females share? Be as specific as possible.
6. Do all STI's affect the reproductive organs? Explain.
7. Discuss how differences in reproductive anatomy lead to differences in how STI's affect males and females.
8. Using the examples discussed in class, describe some of the adaptations STI agents use to initiate infections, evade host defenses, and spread their offspring. Is STI transmission via body fluids symmetrical (i.e., are infected men and infected women equally good at transmitting microbes to uninfected partners)?
9. Describe the potential long-term consequences of untreated STI's in men and women.
10. Discuss the methods currently available for prevention of STI's. What are the difficulties of each? What can we do as a society that might improve prevention?
11. What are the major risk factors for STI's? Explain why pregnant women should be screened for STI's as soon as pregnancy is concerned. Be specific as you describe the risks posed by different STI agents.
12. Where, when, and how did HIV originate? How did political and economic change contribute to its spread?
13. Describe the global scope of the HIV pandemic in terms of the number of people affected and the regions most strongly affected. Where do we expect the problem to worsen over the next decade?
14. Describe the scope of the HIV epidemic in the U.S. How many people are currently living with HIV? How many have died thus far? How many new cases arise annually? Which demographic groups are most strongly affected? Include data in your answers to each question.
15. Describe HIV's adaptations for infection, evading defenses, and dispersing offspring. Be sure to provide a detailed discussion of its effects on the immune system.
16. Why is HIV currently impossible to cure? Why do current treatments involve multiple medications?

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17. Discuss the difficulties involved in developing a vaccine for HIV.
18. "Safe sex" programs in public schools and needle exchange programs in some cities have proven to be effective means to reduce the transmission of HIV. Do you think such programs should be supported or stopped? Give arguments pro and con as well as your final opinion.