Microbe Mission WSU B Station 3

Agricultural manure is a significant waste problem. Even though some of it can be used as fertilizer, it is produced in excess. The manure not only has a foul odor, but contains pathogens, including harmful bacteria, that enter the soil and water sources. Recently, a compound isolated from the thyme plant, called thymol, has been used in farm feedlots where the manure accumulates. Thymol is a natural antiseptic (compound that kills bacteria) and has proved effective in reducing both the odor and the levels of the harmful bacteria.

____ 1. In what other products do you think thymol could most likely be used in?
a. oven cleaner b. mouthwash c. body lotion d. furniture polish

____ 2. Strains of bacteria that survive a treatment of thymol likely do so as a result of which process?
a. respiration b. vaccination c. mutation d. nitrogen fixation

____ 3. Which type of prokaryote is most likely found in agricultural manure?
a. thermophile b. autotroph c. halophile d. saprotroph

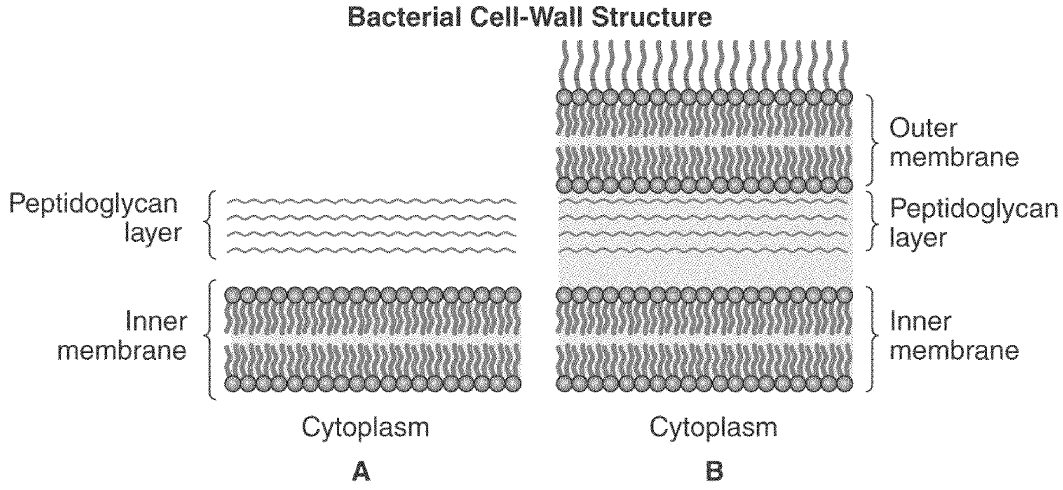


Figure 18-1

____ 4. Figure 18-1 illustrates cell-wall structures of two types of prokaryotes. Which of the following statements about these prokaryotes is accurate?
a. Type A is an archaebacteria. b. Type B resists a gram stain. c. Type B is in the endospore stage.
d. Type A is antibiotic resistant.

____ 5. Nitrogen levels were measured in two adjacent crop fields. One field showed twice the levels of the other field. What is most likely true about the field with the higher levels of nitrogen?
a. The land had more shade-giving trees. b. The crop was soybeans or alfalfa. c. The land received larger amounts of water. d. The crops were planted closer together.

____ 6. A food company wanted to develop a new flavor of cheese. To select which type of bacteria to use, what characteristic of the bacteria should *most likely* be evaluated first?
a. How quickly it breaks down milkfat. b. The final taste that would be produced. c. Whether or not the bacteria is safe for consumption. d. Whether or not the bacteria occurs naturally in the human body.

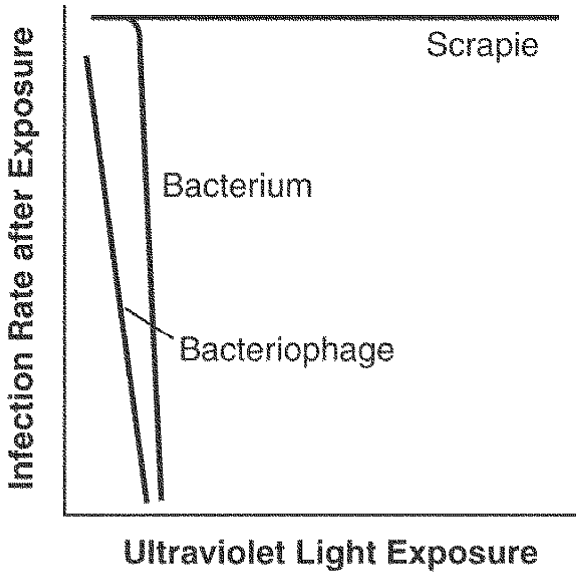
____ 7. A teacher wishes to use two simple objects to demonstrate the relative sizes of a typical virus and bacterial cell. Which two objects should the teacher use for this demonstration?
a. nickel and quarter b. marble and basketball c. baseball and softball d. marble and football field

____ 8. Which is a characteristic of a retrovirus?
a. lacking a capsid b. RNA genome c. protein genome d. capsid of DNA

A student outlined the following steps of the lytic cycle of bacteriophage infection of bacterial cells:
1. Virus lands on host cell.
2. Virus injects the capsid containing its DNA into the cell.
3. Viral DNA is used by bacteria to make virus parts.
4. New viruses are assembled in the bacterial cell.

____ 9. In which step did the student make an error?
a. 1 b. 2 c. 3 d. 4

____ 10. Scientists around the world have been working to develop a medication to prevent or reduce the spread of HIV viruses in the body. If a successful medication was produced, which of the following might it *most likely* be able to do?
a. Disable reverse transcriptase in all cells. b. Convert HIV into a provirus. c. Change the cycle from a lysogenic to a lytic cycle. d. Bind to all of the T4 receptors.



Adapted from Alper et al. 1967 *Nature* 214: 764–766.

Figure 18-2
Effects of increasing UV radiation dose on rates of infection by various agents.

____ 11. Which conclusion can be drawn from the graph in Figure 18-4?
a. Radiation is effective against all infectious diseases. b. Bacteria and bacteriophages are weak infectious agents. c. Bacteriophages are most resistant to UV radiation. d. Prions show a complete tolerance for UV radiation.

____ 12. What is the independent variable in this experiment producing Figure 18-2?
a. the types of diseases b. the amount of time elapsed c. the amount of radiation d. the presence of DNA

____ 13. What do the results shown in Figure 18-2 imply about prions?
a. Prions are indestructible disease agents. b. Prions do not contain components that are vulnerable to UV radiation. c. Prions are not living organisms. d. Prions do not have a cell membrane that sheilds them against UV radiation.

____ 14. Which of the following might display data similar to that of scrapie?
a. cancer cells b. bacterial endospores c. HIV virus d. bacterial capsule

____ 15. Why are prions unlike any other infectious disease?
a. They are extremely small. b. They are both infectious and hereditary. c. They affect only specific species. d. They affect brain tissue.

Microbe Mission WSU B Station 3
Answer Section

1. B
   Mouthwash is the correct answer because many types of bacteria are found in the mouth. The purpose of using mouthwash is to reduce the numbers of these bacteria.

	Feedback
A	Are you sure?
B	You got it!
C	What is the purpose of lotion?
D	Try again...

2. C
   Mutation may provide new characteristics that will allow a bacterial cell to survive and reproduce despite the presence of the thymol.

	Feedback
A	Check your definitions!
B	Refer to page 522.
C	Yes!
D	You might want to read the section one more time...

3. D
   A saprotroph decomposes organic matter most likely to be present in agricultural manure.

	Feedback
A	Not quite...
B	Check your definitions!
C	Look back to page 520.
D	Excellent.

4. B
   The two cell walls belong to a gram-positive eubacteria on the left and a gram-negative eubacteria on the right.

	Feedback
A	Are you sure?
B	Think carefully before you answer...
C	Check back to page 519
D	That's right!

5. B
Soybeans and alfalfa plants have a symbiotic relationship with nitrogen-fixing bacteria that add nitrogen to the soil.

	Feedback
A	Does shade make nitrogen?
B	You got it!
C	Think carefully...
D	Don't plants use up nutrients?

6. C
Bacteria are often still present in products, such as cheese. Safety should always be the top priority before any other considerations.

	Feedback
A	That is important, but....
B	Think carefully...
C	Absolutely! Safety first!
D	Not necessarily...

7. B
Viruses range from 0.005–0.3 micrometers, while bacteria range from 1–10 micrometers in size. The marble and basketball best approach this size difference.

	Feedback
A	These are too similar in size.
B	You got it!
C	These are too similar in size.
D	This is too large a size difference.

8. B
A retrovirus has a protein capsid surrounding a RNA genome.

	Feedback
A	All viruses have a capsid.
B	That's right!
C	A genome must contain nucleic acids.
D	Viral capsids are made of protein.

9. B
The capsid is not injected into the host cell.

	Feedback
A	That step is ok...try again.
B	You have a keen eye for detail! Good job!
C	Check back to page 529.
D	You might want to check your definitions!

10. D
If the medicine bound to the T4 receptors, the HIV virus would not have a place to bind and enter the cell.

	Feedback
A	Would this be a good idea for all cells?
B	Would this stop the infection?
C	Think carefully...
D	Excellent!

11. D
Scrapie, a prion disease, is unaffected by any level of UV radiation.

	Feedback
A	Analyze the graph carefully...
B	Use your knowledge!
C	You can do better...
D	You got it!

12. C
The changes observed in the levels of the infectious agents were a result of increasing amounts of UV radiation.

	Feedback
A	Are you sure?
B	Was time a factor on the graph?
C	Correct!
D	Try again...

13. B
The disease agents tested are of varying complexity and contain different types of components. Bacteria are complex living cells containing many types of compounds. Bacteriophages are virus particles, containing only DNA and protein. Prions, as is now known, consist only of protein. The results imply that prions lack a component that makes them vulnerable to the destructive action of the UV radiation.

	Feedback
A	This statement is too general for the observed results. Only UV radiation is being tested.
B	That's right!
C	Bacteriophages, a type of virus, are not living organisms either.
D	Bacteriophages do not have a membrane either.

14. B
Endospores can withstand extreme conditions, including high levels of UV radiation.

	Feedback
A	Radiation is usually used to treat cancer.
B	Right!
C	The virus would likely respond like the phage.
D	This is a part of typical bacterial cells.

15. B
Prions are unusual in that they may be transmitted through inheritance or between individuals in the same way other infectious agents are transmitted.

	Feedback
A	True, but so are viruses...
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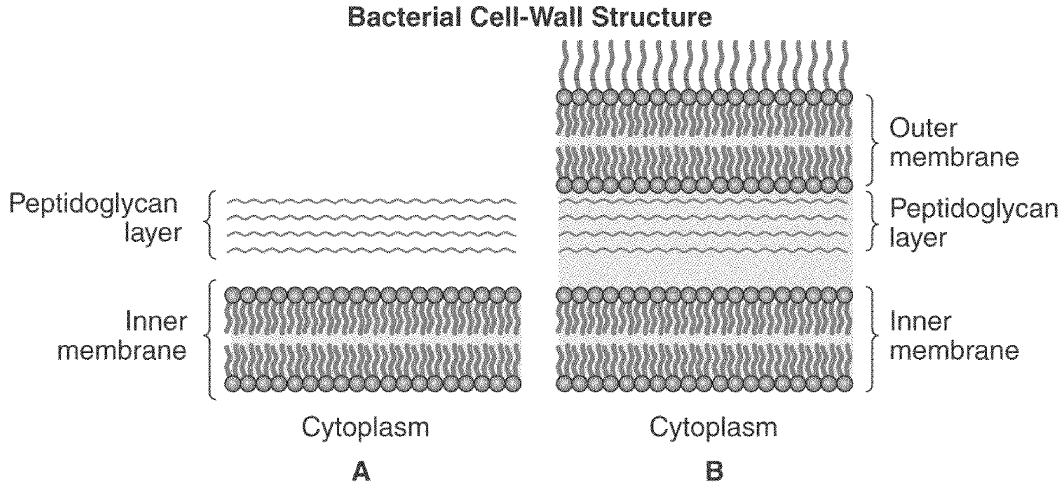

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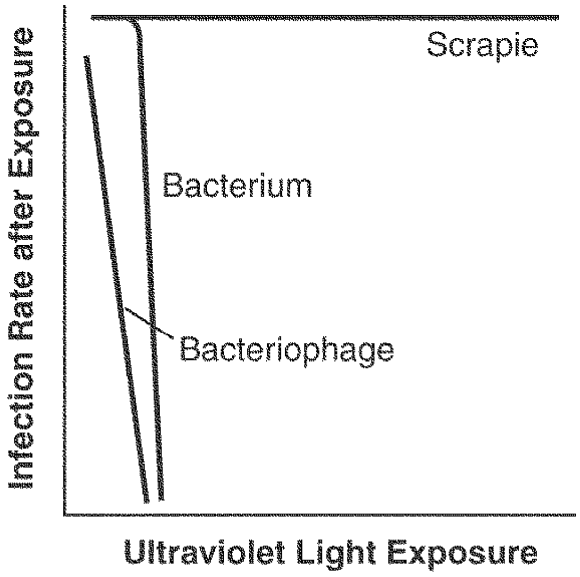

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