Mastery Series: *Streptococcus*

1. What is the Gram reaction of *Streptococcus*?
2. What is the shape and arrangement of *Streptococcus*?
3. Are *Streptococcus* species usually sensitive or resistant to penicillin?
4. Where do *Streptococci* tend to live on our bodies normally?
5. How can *Streptococcus mutans* cause both plaque in the mouth and plaque in the blood vessels?
6. Based on your answer from #5, how does this help you understand why diabetics have a much higher incidence of heart disease than non-diabetics?
7. What therefore ties together caries and heart disease regarding diet?
8. What are two reasons that PCV vaccines are not very effective?
9. Compare the hemolytic abilities of *Streptococcus mutans* and *Streptococcus agalactiae*.
10. What does it mean to be "Beta-hemoytic"?
11. Which pathogen can the rapid strep test confirm?
12. Why are women positive for Group B strep sometimes encouraged to receive antibiotics during delivery?
13. What are two famous diseases caused by *Streptococcus pyogenes*?
14. What is the difference in the cause of between Scarlet Fever and Rheumatic Fever?
15. What are the pathogenic advantages for the Streptococcus pyogenes for:
    a. Capsule
    b. Cell wall
    c. Pyrogenic exotoxins
    d. Invasins
16. Describe carefully how *Streptococcus pyogenes* can lead to a Type II hypersensitivity (autoimmune reaction).

Mastery Series ANSWERS: *Streptococcus*

1. What is the Gram reaction of *Streptococcus*? positive
2. What is the shape and arrangement of *Streptococcus*? Chains of spheres
3. Are *Streptococcus* species usually sensitive or resistant to penicillin? sensitive
4. Where do *Streptococci* tend to live on our bodies normally? Mucous membranes, especially the oral cavity
5. How can *Streptococcus mutans* cause both plaque in the mouth and plaque in the blood vessels? Its glycocalyx becomes sticky with sugar and is able to adhere to teeth and to blood vessel walls
6. Based on your answer from #5, how does this help you understand why diabetics have a much higher incidence of heart disease than non-diabetics? They have higher blood sugar, so if Streptococci or other bacteria are in the bloodstream, they may be able to more easily attach to blood vessel walls.
7. What therefore ties together caries and heart disease regarding diet? sugar
8. What are two reasons that PCV vaccines are not very effective? made to bacterial cell walls; there are many strains of Streptococcus pneumoniae
9. Compare the hemolytic abilities of *Streptococcus mutans* and *Streptococcus agalactiae*. *S. mutans* is alpha hemolytic and *S. agalactiae* is Beta hemolytic.
10. What does it mean to be "Beta-hemoytic"? able to lyse (break) red blood cells
11. Which pathogen can the rapid strep test confirm? *Streptococcus pyogenes*
12. In rare cases, *S. agalactiae* can cause pneumoniae or meningitis is newborns, although in the mother it is asymptomatic.
13. What are two famous diseases caused by *Streptococcus pyogenes*? Strep throat and necrotizing fasciitis (flesh-eating disease)
14. What is the difference in the cause of between Scarlet Fever and Rheumatic Fever? Scarlet fever is caused by an inflammatory reaction to the erythrogenic toxins of *S. pyogenes*. Rheumatic fever is an autoimmune reaction that occurs if antibodies made to S. pyogenes recognize and attack the joints or heart valves
15. What are the pathogenic advantages for the Streptococcus pyogenes for:
    a. Capsule—made of hyaluronic acid that resembles our connective tissue; helps bacteria hide and avoid phagocytosis
    b. Cell wall—M protein helps adhere/avoid phagocytosis/block complement; lipotechoic acids trigger cytokine storm
    c. Pyrogenic exotoxins—inflammation can help bacteria spread
    d. Invasins—move through the tissues (consider necrotizing fasciitis)
16. A helper T cell recognizes part of S. pyogenes (typically its M protein) and makes antibodies to it. However the same antibody that is effective against S. pyogenes sometimes also recognizes an antigen on heart valves and/or joints. This may result in autoimmune inflammation and possible permanent heart damage. Certain S. pyogenes strains are particularly linked with provoking autoimmune reactions.