

19 – Pathogenic Gram-Positive Bacteria

Staphylococcus

1. *Describe this genus with respect to the human microbiota, salt tolerance, and catalase production.*
 - a. They are **salt tolerant** in they are capable of growing in media that are up to 10% NaCl, which explains how they tolerate the salt deposited on human skin by sweat glands.
 - b. Further, *Staphylococcus* synthesizes catalase.
 - i. A characteristic that distinguishes this genus from other low G + C Gram-positive cocci.
2. *Discuss the structural and enzymatic features and toxins of Staphylococcus that enable it to be pathogenic.*
 - a. **Structural Defenses**
 - i. Protein A coats the cell surface which interferes with phagocytic cells and inhibits the complement cascade.
 - ii. Bound coagulase, converts fibrinogen to fibrin molecules and fibrin clots hide the bacteria from phagocytes cells.
 - iii. Synthesized polysaccharide slime layers, inhibit leukocyte chemotaxis and phagocytosis and facilitate attachment of staphylococcus to surfaces.
 - b. **Enzymatic Defenses**
 - i. Cells release coagulase (*S. Aureus* only) to trigger blood clotting.
 - ii. Hyaluronidase breaks down hyaluronic acid and enables the bacteria to spread between the cells.
 - iii. Staphylokinase dissolves fibrin threads in blood clots and allows *S. Aureus* to free itself from clots.
 - iv. Lipases digests lipids and allows staph to grow on skin and oil glands.
 - v. Beta lactamase breaks down penicillin and allows bacteria to survive treatment of beta lactam antimicrobial drugs
 - c. **Toxins**
 - i. Cytolytic toxins disrupt the cytoplasmic membrane of a variety of cells.
Exfoliative toxins cause skin cells to separate and slough off.
Toxic shock syndrome toxins causes toxic shock.
Enterotoxin stimulates symptoms associated with food poisoning.
3. *Describe the symptoms and prevention of staphylococcal food poisoning.*
 - a. Food poisoning is due to ingestion of enterotoxin-contaminated food rather than the invasion of bacteria.
 - b. Symptoms, which include nausea, severe vomiting, diarrhea, headache, sweating, and abdominal pain, usually appear within four hours following ingestion.
 - c. Prevention methods include avoid leaving food at room temperature or warmer for several hours.