Mechanisms of Human Disease
Staphylococci
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1. Important Species
   a. S. aureus
      i. Habitat
      ii. Factors Predisposing to serious infection
      iii. Serious Infections
         1. Furuncle
         2. Carbuncle
         3. Toxin-Mediated Infections
         4. Disseminated Infections
      iv. Virulence Factors
         1. Hemolysins
         2. Toxins
         3. Enzymes
         4. Superantigens
   b. Staphylococcus epidermidis
   c. Staphylococcus saprophyticus
   d. Staphylococcus lugdunensis

2. Key Characteristics
   a. Laboratory Identification
      i. Coagulase
      ii. Latex Agglutination
      iii. Media

3. MRSA
   a. Mechanism of resistance – mecA Gene
   b. Transmission in Hospitals
   c. Transmission outside Hospitals – Community Acquired
   d. Clinical Considerations
   e. Surveillance Testing

Lab Test Spotlight: Latex Agglutination
Latex agglutination is a laboratory method that can be used to identify the presence of a specific molecule or analyte. A 'sample' containing the suspected antigen (or antibody) is mixed with latex particles that contain an antibody (or antigen) that are coated onto the surface of latex particles. The sample may be a bacterial colony or a specimen taken directly from a patient (stool, serum, cerebral spinal fluid, etc.). The reaction between an antigen and an antibody results in visible clumping called agglutination.

The following video provides a good visual example of how latex agglutination works for the detection of Staphylococcus aureus via protein A on the surface of the bacteria.
In class we discussed several uses of latex agglutination.

1. Coagulase test—detects free or bound coagulase, also known as clumping factor.
   a. Bacterial colony is mixed with latex particles
   b. Latex particles are coated with fibrinogen and IgG
   c. Agglutination occurs if the organism produces coagulase, which converts fibrinogen to fibrin = clot and protein A, which binds to Fc portion of IgG molecule
   d. Agglutination = identification of *Staphylococcus aureus*

2. Lancefield typing—separates streptococci into groups by detection of specific carbohydrate antigens
   a. Bacterial colony is mixed with latex particles
   b. Latex particles are coated with antibodies to different streptococcal grouping antigens
   c. Agglutination occurs if the organism contains an antigen in its cell wall
   d. Nearly all beta hemolytic streptococci contain a streptococcal grouping antigen
   e. Some alpha hemolytic streptococci (and Enterococcus) contain a streptococcal grouping antigen (this test is not routinely performed on alpha hemolytic organisms in the clinical laboratory)
   f. Agglutination = grouping/identification of Lancefield group A, B, C, D, F, or G

3. Antistreptolysin O—detects antibodies to Streptolysin O to aid in the diagnosis of rheumatic fever
   a. Patient serum is mixed with latex particles
   b. Latex particles are coated with Streptolysin O
   c. Agglutination occurs if patient has made antibodies to Streptolysin O
   d. Agglutination = the patient has been recently exposed to *Streptococcus pyogenes*