

Staphylococci and Streptococci

Bacteria	Lab	Important Features	Diseases	Treatment/Diagnosis
Staphylococcus aureus	<ul style="list-style-type: none"> -Spherical gram-positive cocci arranged in irregular grapelike clusters. -Produces a carotenoid pigment called staphyloxanthin, which imparts a golden color to its colonies. 	<ul style="list-style-type: none"> -Catalase positive -Coagulase positive -β-hemolysis of red blood cells -Ferments mannitol \rightarrow yellow agar -Protein A on surface -More than 90% of <i>S. aureus</i> strains contain plasmids that encode βlactamase (degrades penicillin). -Some strains are methicillin-resistant (MRSA), some with intermediate resistance to vancomycin (VISA), some with full resistance to vancomycin (VRSA) and some with resistant to nafcillin (NRSA). -Colonizes: nose, skin. -Hand contact is an important mode of transmission. -Exotoxins produced: enterotoxin, TSST, exfoliatin, alpha toxin and P-V leukocidin. -Blood cultures typically do not grow <i>S. aureus</i>. 	<ul style="list-style-type: none"> -Abscesses and various pyogenic (pus producing) infections (such as endocarditis, septic arthritis, and osteomyelitis) \rightarrow due to its ability as a facultative anaerobe. -Food poisoning \rightarrow due to production of a toxin. -Scalded skin syndrome and toxic shock syndrome \rightarrow due to production of two exotoxins. - Hospital-acquired pneumonia, septicemia, and surgical-wound infections (most common cause). -An important cause of skin infections, such as folliculitis cellulitis, and impetigo. -The most common cause of bacterial conjunctivitis (eye rubbing). -Kawasaki syndrome may be caused by <i>S. Aureus</i>. 	<ul style="list-style-type: none"> -Strains that produce β-lactamase are resistant to penicillin G, so don't give it. -Such organisms can be treated with β-lactamase-resistant penicillins (e.g., nafcillin or cloxacillin), some cephalosporins, or vancomycin. -Treatment with a combination of a β-lactamase-sensitive penicillin (e.g., amoxicillin) and a β-lactamase inhibitor (e.g., clavulanic acid) is also useful. -Ceftaroline fosamil is useful for the treatment of MRSA infections. - Daptomycin (Cubicin) and Quinupristin-dalfopristin (Synercid)-streptogramins (linezolid) can be used to treat infections by VISA and VRSA strains. -Mupirocin is a topical antibiotic in skin infections. -Drainage is the cornerstone of abscess treatment. -Cefazolin is used peri-operatively to prevent staphylococcal surgical wound infections.
Staphylococcus epidermis	<ul style="list-style-type: none"> -Spherical gram-positive cocci arranged in irregular grapelike clusters -Produces white colonies 	<ul style="list-style-type: none"> -Catalase positive -Coagulase negative -Urease positive -Sensitive to novobiocin -Doesn't produce exotoxins. -Almost always hospital-acquired 	<ul style="list-style-type: none"> -Endocarditis -Prosthetic joint infections -Major cause of sepsis in neonates 	<ul style="list-style-type: none"> -<i>S. epidermidis</i> is highly antibiotic resistant. -MSSE are sensitive to β-lactamase-resistant drugs such as nafcillin. -MRSE is treated by vancomycin.

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Staphylococcus saprophyticus	Spherical gram-positive cocci arranged in irregular grapelike clusters	<ul style="list-style-type: none"> -Catalase positive -Coagulase negative -Urease positive -Resistant to novobiocin -Doesn't produce exotoxins -Almost always community-acquired 	<ul style="list-style-type: none"> -Urinary tract infections -Found primarily on the mucosa of the genital tract 	-Treated with trimethoprim-sulfamethoxazole or a quinolone (ciprofloxacin).
Streptococcus pyogenes	Gram positive cocci arranged in chains or pairs	<ul style="list-style-type: none"> -All streptococci are catalase-negative -Group A -β-hemolytic -Encapsulated -Has M protein -Produce three important inflammation related –Invasion related factors: hyaluronidase, streptokinase (fibrinolysin) and DNase (streptodornase). -Produces five important EXOtoxins and hemolysins: Erythrogenic toxin, Streptolysin O, Streptolysin A, Pyrogenic exotoxin A, Exotoxin B. 	<ul style="list-style-type: none"> -The leading bacterial cause of pharyngitis and cellulitis -Impetigo (similar to S.a.) -Necrotizing fasciitis -Streptococcal toxic shock syndrome (similar toxin to that present in S.a.) -Rheumatic fever –which also affects the heart- -Acute glomerulonephritis- affects the kidney -Scarlet fever 	<ul style="list-style-type: none"> -Diagnosis: bacitracin sensitive -Treatment: -Penicillin G or amoxicillin, -In mild group A streptococcal infections, oral penicillin V can be used. -In penicillin-allergic patients, erythromycin or one of its long-acting derivatives (e.g., azithromycin) can be used. -Clindamycin can also be used in penicillin-allergic patients -Prevention: rheumatic fever can be prevented by prompt treatment of group A streptococcal pharyngitis with penicillin.
Streptococcus agalactiae	Gram positive cocci arranged in chains or pairs	<ul style="list-style-type: none"> -All streptococci are catalase-negative -Group B -β-hemolytic -It colonizes the genital tract of some women -In the vagina and colon 	<ul style="list-style-type: none"> -The leading cause of neonatal sepsis and meningitis -GBS is capable of causing infections in adults (such as pneumonia, endocarditis, arthritis, cellulitis, and osteomyelitis), postpartum endometritis also occurs 	<ul style="list-style-type: none"> -Diagnosis: bacitracin resistant; hippurate hydrolyzed -Treatment: penicillin G or ampicillin -Prevention: neonatal sepsis can be reduced by a combination of two approaches: <ul style="list-style-type: none"> 1. If vaginal and rectal cultures are positive, penicillin or ampicillin should be

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Streptococcus agalactiae (Cont.)				administered intravenously at the time of delivery. 2. If the patient has not had cultures done, then penicillin G (or ampicillin) should be administered intravenously at the time of delivery to women who experience prolonged (longer than 18 hours) rupture of membranes
Streptococcus pneumonia	Gram positive lancet-shaped cocci arranged in pairs (diplococci) or short chains	-All streptococci are catalase-negative -Group NA ⁴ -α-hemolytic -found on the skin and in the oropharynx in small numbers -Has polysaccharide capsules -Cell wall contains teichoic acid (C substance) which reacts with CRP. -Humans are the natural hosts for pneumococci	-Pathogenesis by S. pneumoniae and the viridans streptococci is uncertain, as no exotoxins or tissue-destructive enzymes have been demonstrated -Causes pneumonia, otitis media, sinusitis, mastoiditis, conjunctivitis, purulent bronchitis, pericarditis, UTRI, bacterial meningitis, bacteremia, and sepsis. -Pneumonia: sputum is a red or brown “rusty” color	- Diagnosis: bile-soluble; inhibited by optochin (are lysed by bile or deoxycholat) -Culture of cerebrospinal fluid is usually positive in meningitis. - Treatment: -Penicillin -If penicillin-resistant: erythromycin and vancomycin. -A fluoroquinolone with good antipneumococcal activity, such as levofloxacin, can also be used. -Ceftriaxone or levofloxacin can be used for less severely ill patients - Prevention: immunization with the 13-valent pneumococcal conjugate vaccine (Prevnar 13).
Viridans group (S. sanguinis, S. mutans, S. mitis, S. gordonii, S. salivarius, S. anginosus, S. milleri, S. intermedius)	Gram positive cocci arranged in chains or pairs	--All streptococci are catalase-negative -Group NA - α-hemolytic -Found chiefly in the oropharynx	-The most common cause of endocarditis -The main cause of dental caries -Often found in brain abscesses following dental surgery	-Diagnosis: not bile-soluble; not inhibited by optochin (resistant to lysis by bile) -Endocarditis caused by most viridans streptococci is curable by prolonged penicillin treatment

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Viridans group (Cont.)		-Many of the strains of viridans streptococci that cause endocarditis produce a glycocalyx that enables the organism to adhere to the heart valve	-Pathogenesis by <i>S. pneumoniae</i> and the viridans streptococci is uncertain, as no exotoxins or tissue-destructive enzymes have been demonstrated	
Enterococcus faecalis	Gram positive cocci arranged in chains or pairs	-All streptococci are catalase-negative -Group D -Grow on bile-esculin agar - α , β or non-hemolytic -Enterococci and anaerobic streptococci are located in the colo	-An important cause of hospital-acquired urinary tract infections and endocarditis.	- Diagnosis: growth in 6.5% NaCl, hydrolyze esculin in the presence of bile (i.e., they produce a black pigment on bile-esculin agar). -Resistant to penicillins - Treatment: we utilize the synergistic combination of penicillin or vancomycin and an aminoglycoside (e.g., gentamicin) to kill enterococci -Vancocycin resistant enterococci are killed by a linezolid (Zyvox) and daptomycin (Cubicin).
Streptococcus bovis	Gram positive cocci arranged in chains or pairs	-All streptococci are catalase-negative - Group D -Grow on bile-esculin agar - α or non-hemolytic	-Causes endocarditis	- Diagnosis: no growth in 6.5% NaCl, hydrolyze esculin in the presence of bile (i.e., they produce a black pigment on bile-esculin agar). -Sensitive to penicillins
Peptostreptococci		-Grow under anaerobic or microaerophilic conditions -Produce variable hemolysis -Members of the normal flora of the gut, mouth, and female genital tract	-Participate in mixed anaerobic infections -Often found in brain abscesses following dental surgery	

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