

به نام خدا

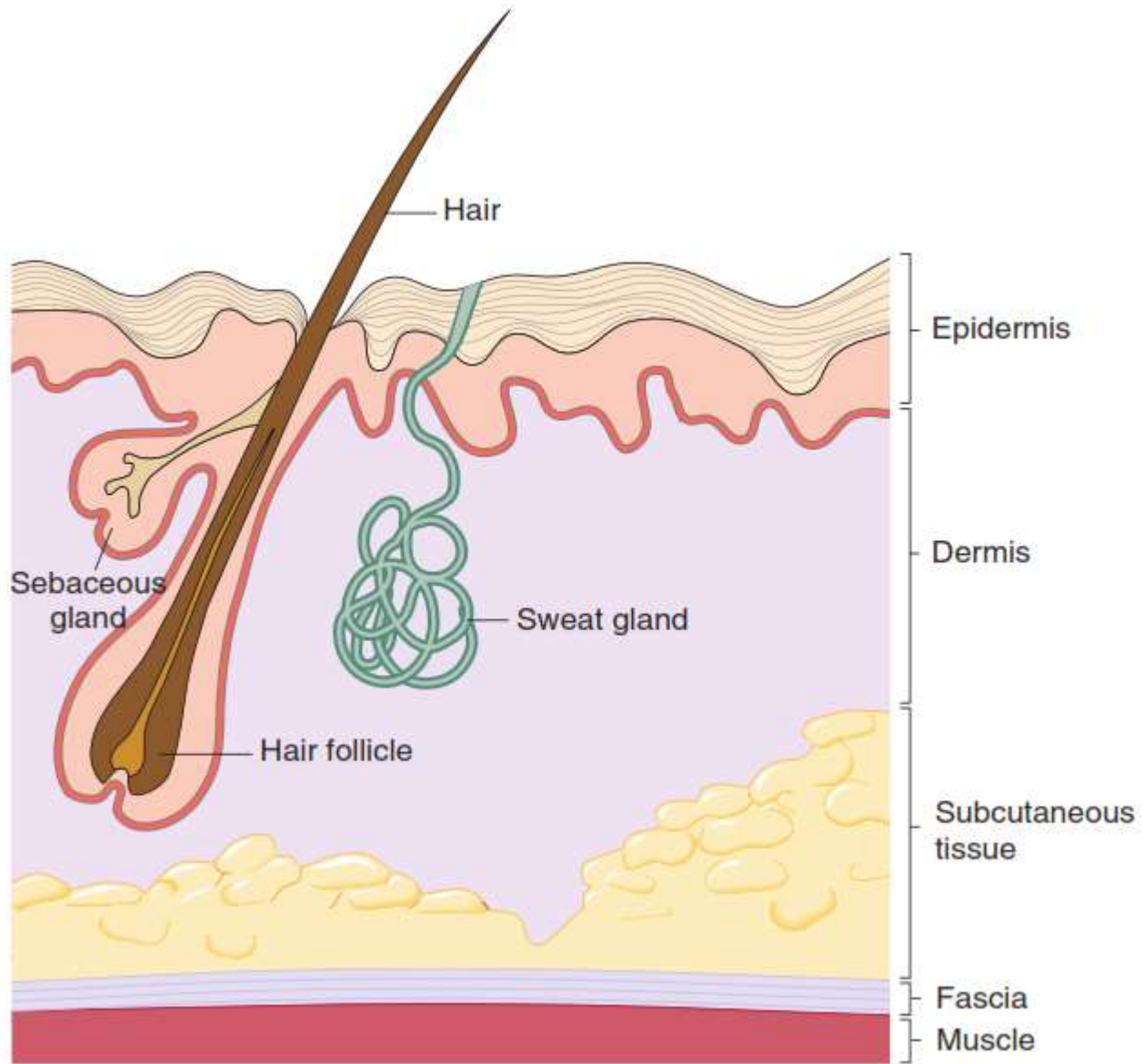


Bacteriology Lab 2

By: **Dr. A. Mohammadi**

Department of Biology,
Faculty of science,
University of Alzahra

میکروارگانیزم های پوست و زخم



• **Figure 75-1** Diagram of the skin.

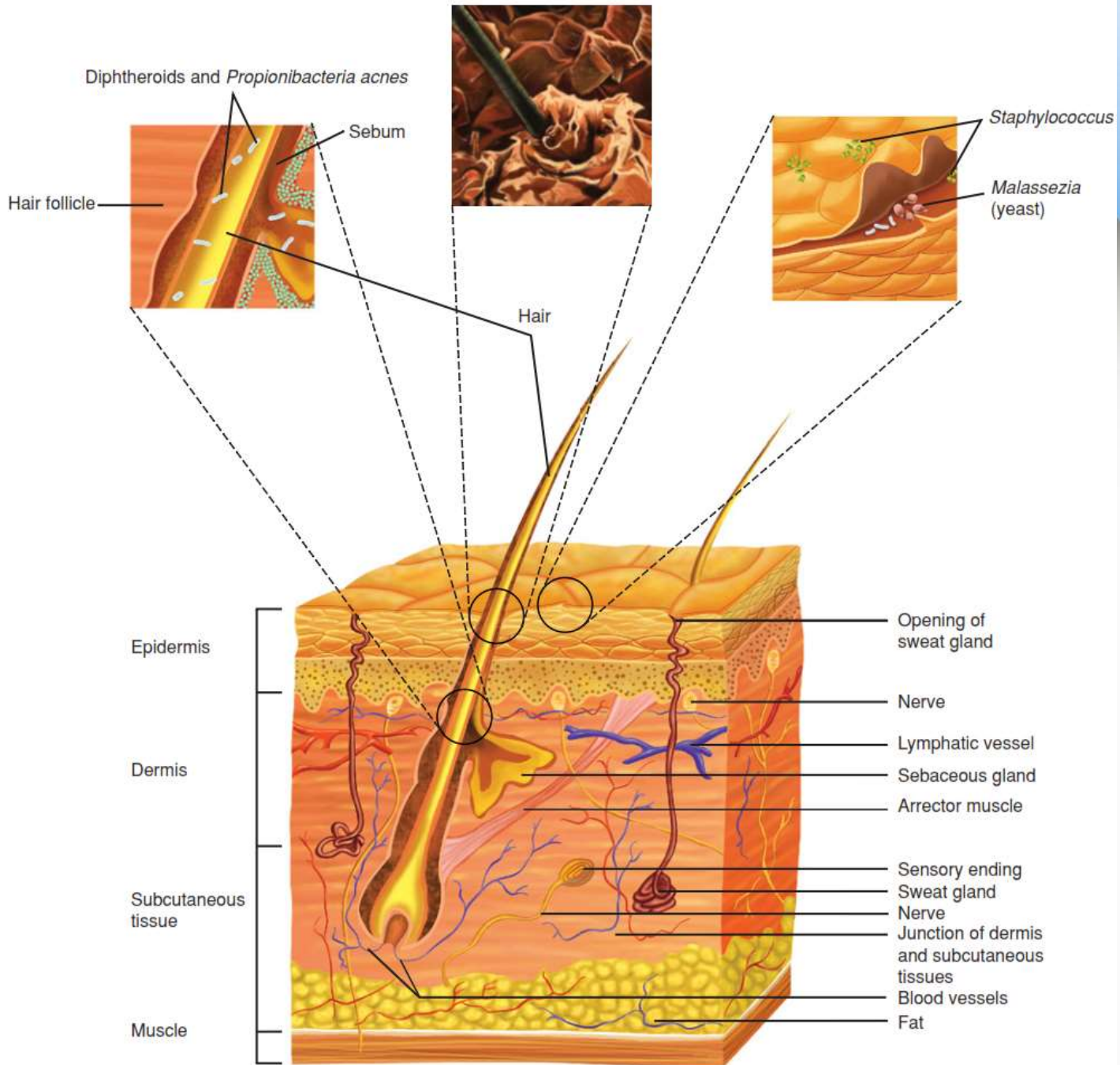
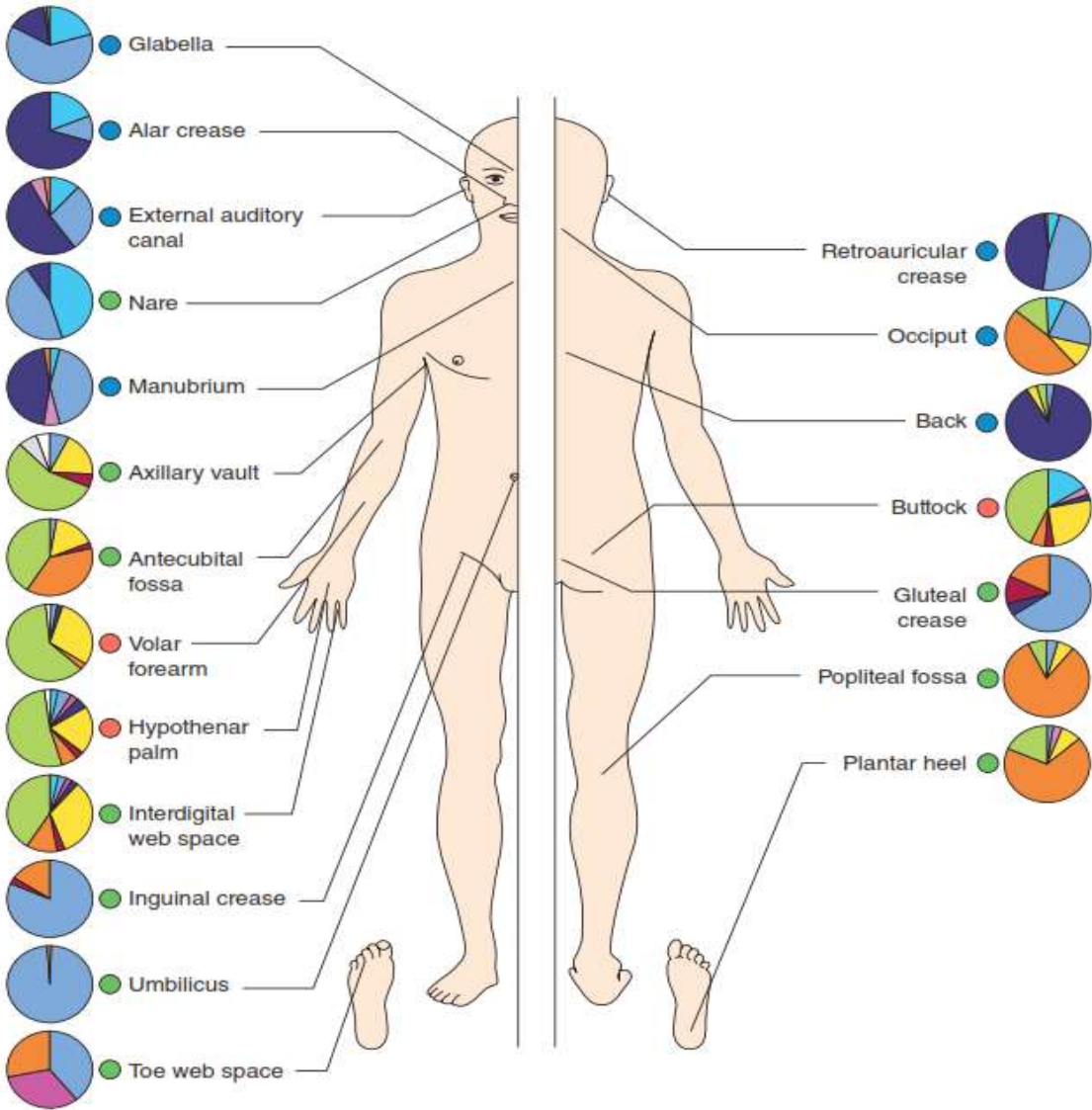


Figure 1-2. Anatomy of skin and sites where the microbes can dwell.



Actinobacteria

- Corynebacteriaceae
- Propionibacteriaceae
- Micrococcaceae
- Other actinobacteria

Bacteroidetes

Cyanobacteria

Firmicutes

- Other firmicutes
- Staphylococcaceae

Proteobacteria

■ Divisions contributing <1%

■ Unclassified

- Sebaceous
- Moist
- Dry

FIGURE 10-1 Topographical distribution of bacteria on skin sites. The skin microbiome is highly dependent on the microenvironment of the sampled site. The family-level classification of bacteria colonizing an individual subject is shown with the phyla in *bold*. The sites selected were those that show a predilection for skin bacterial infections and are grouped as sebaceous or oily (*blue circles*); moist (typically skin creases; *green circles*); and dry; flat surfaces (*red circles*). The sebaceous sites are the glabella (between the eyebrows), alar crease (side of the nostril; external auditory canal (inside the ear)), retroauricular crease (behind the ear), occiput (back of the scalp), antecubital fossa (inner elbow), interdigital web space (between the middle and ring fingers), popliteal fossa (behind the knee), plantar heel (bottom of the heel of the foot), toe web space, and umbilicus (navel). Dry sites are the volar forearm (inside of the midforearm), hypothenar palm (palm of the hand proximal to the little finger), and buttock. (Reprinted by permission from Macmillan Publishers Ltd: Grice EA, Segre JA. The skin microbiome. *Nature Rev Microbiol* 2011;9:244-253. Copyright © 2011.)

• **BOX 75-1** Normal Microbiota of the Skin

Diphtheroids

Staphylococcus epidermidis

Other coagulase-negative staphylococci

Propionibacterium acnes

TABLE 33-1 Order of Bacteria Causing Skin and Soft Tissue Infections in North America, 1998-2004

Rank	Pathogen	No. of Isolates (% of total)
1	<i>Staphylococcus aureus</i>	2602 (44.6)
2	<i>Pseudomonas aeruginosa</i>	648 (11.1)
3	<i>Enterococcus</i> spp.	542 (9.3)
4	<i>Escherichia coli</i>	422 (7.2)
5	<i>Enterobacter</i> spp.	282 (4.8)
6	<i>Klebsiella</i> spp.	248 (4.2)
7	β-Hemolytic streptococci	237 (4.1)
8	<i>Proteus mirabilis</i>	166 (2.8)
9	Coagulase-negative staphylococci	161 (2.8)
10	<i>Serratia</i> spp.	125 (2.1)

From Moet GJ, et al: Contemporary causes of skin and soft tissue infections in North America, Latin America, and Europe: report from the SENTRY Antimicrobial Surveillance Program (1998-2004), *Diagn Microbiol Infect Dis* 57:7, 2007.

TABLE A-12. Common Causes of Infectious Diseases of Skin or Integument*

Microorganism	Common Cause(s)	Disease(s)
Bacteria	<i>Staphylococcus aureus</i>	Impetigo, bullous impetigo, scalded-skin syndrome, folliculitis, furuncles, carbuncles, cellulitis, myositis, and toxic shock syndrome
	<i>Streptococcus pyogenes</i>	Impetigo, scarlet fever, erysipelas, necrotizing fasciitis, and streptococcal toxic shock syndrome
	<i>Propionibacterium acne</i>	Acne
Viruses	Herpes simplex 1 and 2 viruses	Oral and genital herpes
	Human papillomaviruses	Warts, genital warts, cervical dysplasia, and cervical carcinoma
Fungi	<i>Malassezia furfur</i>	Tinea versicolor
	The dermatophytes: <i>Microsporum</i> , <i>Trichophyton</i> and <i>Epidermophyton</i>	Tinea pedis, tinea corporis, tinea capitis, tinea manus, tinea unguium, and tinea cruris
	<i>Candida albicans</i>	Intertrigo, thrush, perlèche, folliculitis, paronychia, and onychomycosis

*Note this is not an exhaustive list and does not include all possible etiologies for a particular disease.

TABLE 33-2 Infections Secondary to Preexisting Skin Lesions

Infection	Major Pathogen
Surgical Wound Infection	
Clean	<i>Staphylococcus aureus</i> , gram-negative bacilli
Contaminated, such as colon	Plus Enterobacteriaceae, anaerobes, streptococci
Intravenous infusion sites	<i>S. aureus</i> , coagulase-negative staphylococci
Trauma	
Soil contamination	<i>Pseudomonas aeruginosa</i> , <i>Clostridium</i> spp.
Freshwater contamination	<i>Aeromonas</i> , <i>Plesiomonas</i> , <i>Mycobacterium marinum</i>
Saltwater contamination	<i>Vibrio vulnificus</i> , <i>M. marinum</i>
Intravenous drug use	<i>S. aureus</i> , <i>Pseudomonas</i> spp., <i>Clostridium</i> spp.
Bites	
Human	Oral aerobes and anaerobes, <i>S. aureus</i>
Dog, cat	<i>Pasteurella multocida</i> , <i>S. aureus</i> , <i>Capnocytophaga canimorsus</i> , anaerobes
Rat	<i>Streptobacillus moniliformis</i> , <i>Spirillum minus</i>
Other	
Decubitus ulcer	Streptococci, <i>S. aureus</i> , coliforms, <i>Pseudomonas</i> spp., anaerobes, including <i>Bacteroides fragilis</i>
Foot ulcer in diabetic patients	<i>S. aureus</i> , streptococci, coliforms, <i>P. aeruginosa</i> , anaerobes
Hidradenitis suppurativa	<i>S. aureus</i> , streptococci, coliforms, <i>Pseudomonas</i> spp., anaerobes
Burns	<i>S. aureus</i> , <i>Candida</i> , <i>P. aeruginosa</i>



FIGURE 33-2 Tinea corporis.

Term	Description	Possible Etiologic Agents (Infections)
Macule	A circumscribed (limited), flat discoloration of the skin	Dermatophytes <i>Treponema pallidum</i> (secondary syphilis) Viruses such as enteroviruses (exanthems rashes)
Papule	An elevated, solid lesion ≤ 5 mm in diameter	Human papillomavirus types 3 and 10 (flat warts) Pox virus (molluscum contagiosum) <i>Sarcoptes scabiei</i> (scabies) <i>Staphylococcus aureus</i> , <i>Pseudomonas aeruginosa</i> , etc. (folliculitis)
Nodule	A raised, solid lesion > 5 mm in diameter	<i>Corynebacterium diphtheriae</i> <i>Sporothrix schenckii</i> Miscellaneous fungi (subcutaneous mycoses) <i>Mycobacterium marinum</i> <i>Nocardia</i> spp. <i>S. aureus</i> (furuncle)
Pustule	A circumscribed, raised, pus-filled (leukocytes and fluid) lesion	<i>Candida</i> spp. Dermatophytes Herpes simplex virus <i>Neisseria gonorrhoeae</i> (gonorrhea) <i>S. aureus</i> (folliculitis) <i>S. aureus</i> or group A streptococci (impetigo) Varicella-zoster virus (chickenpox)
Vesicle	A circumscribed, raised, fluid-filled (blisterlike) lesion ≤ 5 mm in diameter	Herpes simplex virus Varicella-zoster virus (chickenpox and shingles)
Bulla	A circumscribed, raised, fluid-filled lesion > 5 mm in diameter	Clostridial species (necrotizing gas gangrene) Herpes simplex virus Other gram-negative bacilli <i>S. aureus</i> (bullous impetigo and scalded skin syndrome) <i>Vibrio vulnificus</i> and other <i>Vibrio</i> spp.
Scales	Dry, horny, platelike lesions	Dermatophytes (tinea)
Ulcer	A lesion with loss of epidermis and dermis	<i>Bacillus anthracis</i> (cutaneous anthrax) Bowel microbiota (decubiti) <i>Haemophilus ducreyi</i> (chancroid) <i>T. pallidum</i> (chancre of primary syphilis)

Adapted from Lazar AJF: *Robbins basic pathology*, ed 8, St Louis, 2010, Saunders.

Dr. A. Mohammadi

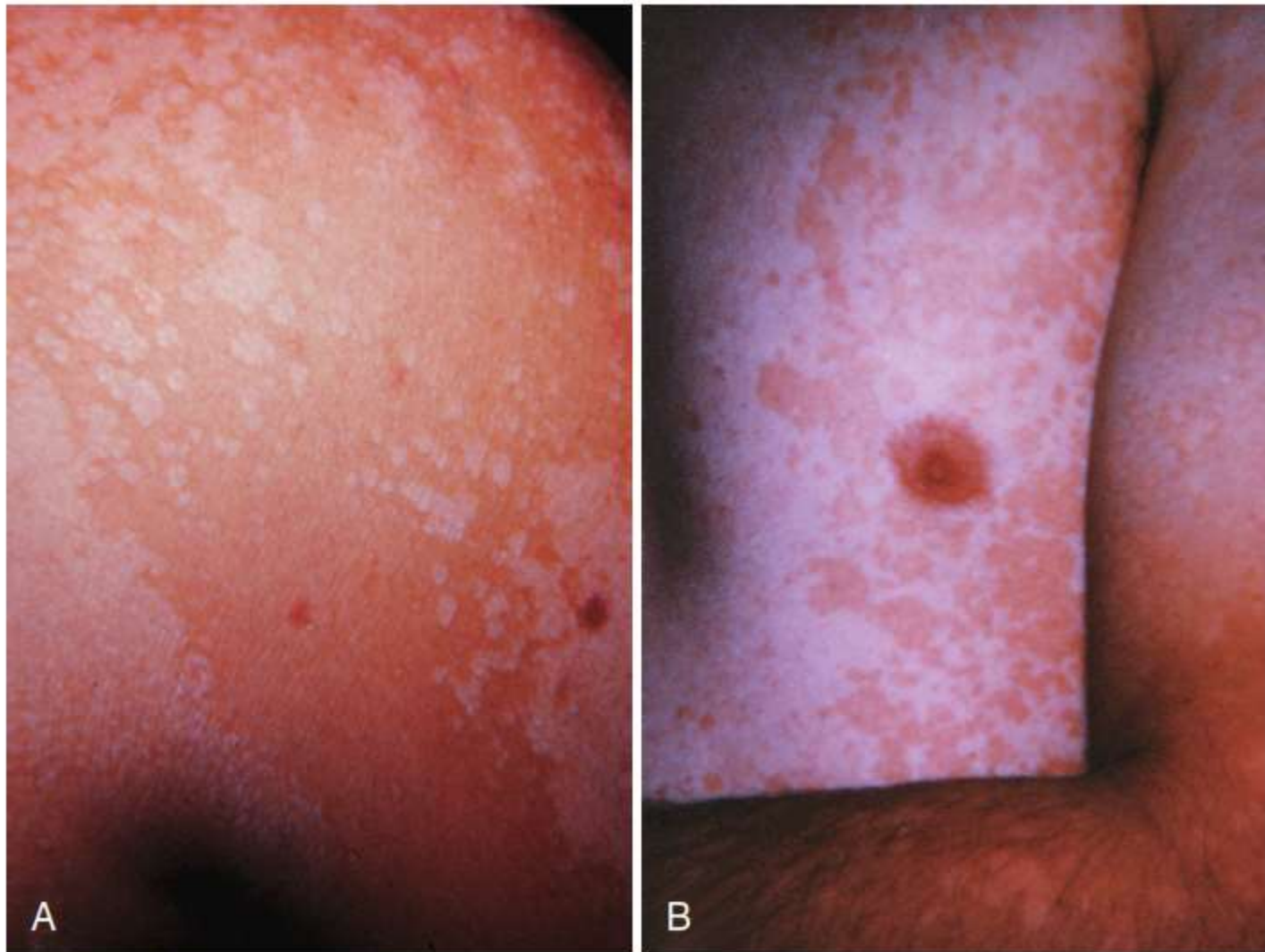


FIGURE 33-4 Hypopigmented (A) and hyperpigmented (B) rash of tinea versicolor.



Figure 1-4. A schematic of a macule, which is a flat lesion usually less than 1 cm in diameter that can be brown, blue, red, or hypopigmented. Note the change in the color of the skin. The lesion cannot be felt but must be seen to be detected.

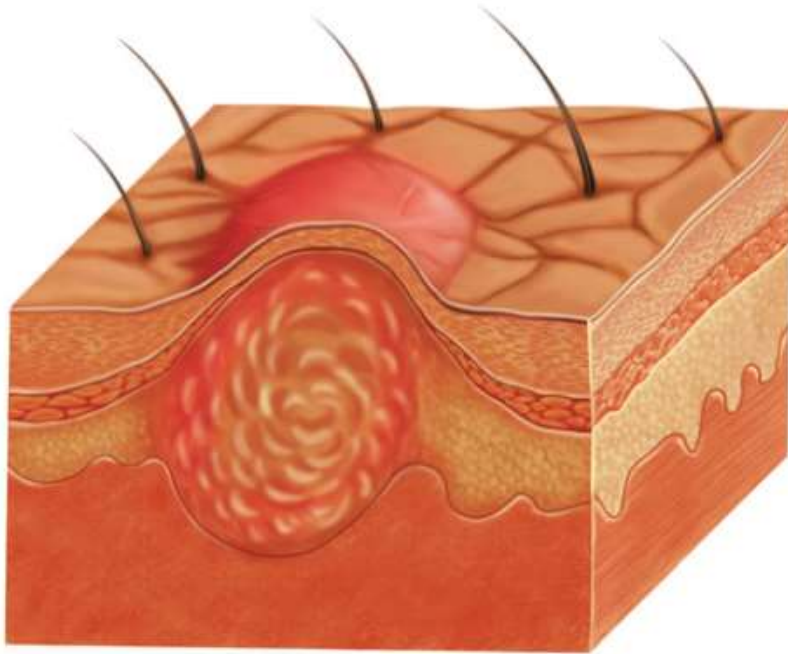


Figure 1-5. A schematic of a papule, a small (<0.5 cm in diameter) solid, elevated skin lesion. The top of a papule can be flat, pointed, or rounded.

TABLE 33-3 Common Primary Pyodermas

Infection	Organism	Comments
Impetigo	<i>Streptococcus pyogenes</i> , occasionally; <i>Staphylococcus aureus</i> , if bullous	Children affected most; communicable; no fever
Erysipelas	<i>S. pyogenes</i> , occasionally; other β -hemolytic streptococci or <i>S. aureus</i>	Distinct raised borders; fever common
Cellulitis	<i>S. pyogenes</i> , <i>S. aureus</i> ; <i>Haemophilus influenzae</i> in children	Erythema, tenderness, pain, edema, warmth; fever common
Folliculitis	<i>S. aureus</i> ; gram-negative bacilli or <i>Candida</i> if predisposing conditions	<i>Papules around hair follicles; areas exposed to whirlpool bath (Pseudomonas aeruginosa)</i>
Furuncle	<i>S. aureus</i>	Fluctuant, painful nodules often in intertriginous areas
Carbuncle	<i>S. aureus</i>	Multiple abscesses
Paronychia	<i>S. aureus</i> , gram-negative bacilli, <i>Candida</i>	Periungual swelling

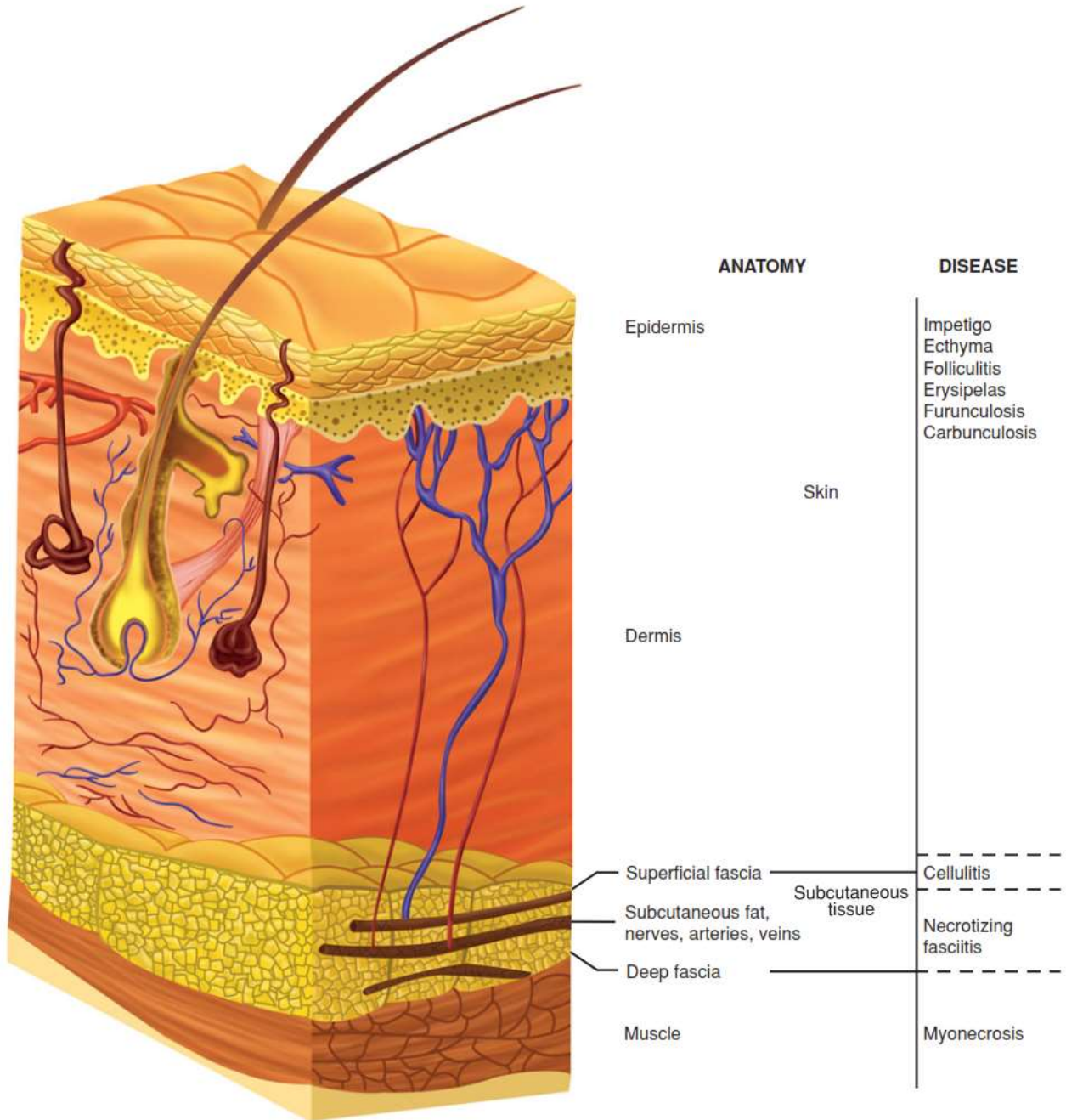


Figure 3-19. A schematic showing sites of damage caused by subcutaneous necrotizing infections compared to other infections of the skin.



FIGURE 33-5 Bullous impetigo caused by *Staphylococcus aureus*.

The most common bacterial causes of skin infection are *Staphylococcus aureus*, *Streptococcus pyogenes*, and *Propionibacterium acne*.



FIGURE 33-6 Erysipelas caused by *Streptococcus pyogenes*.



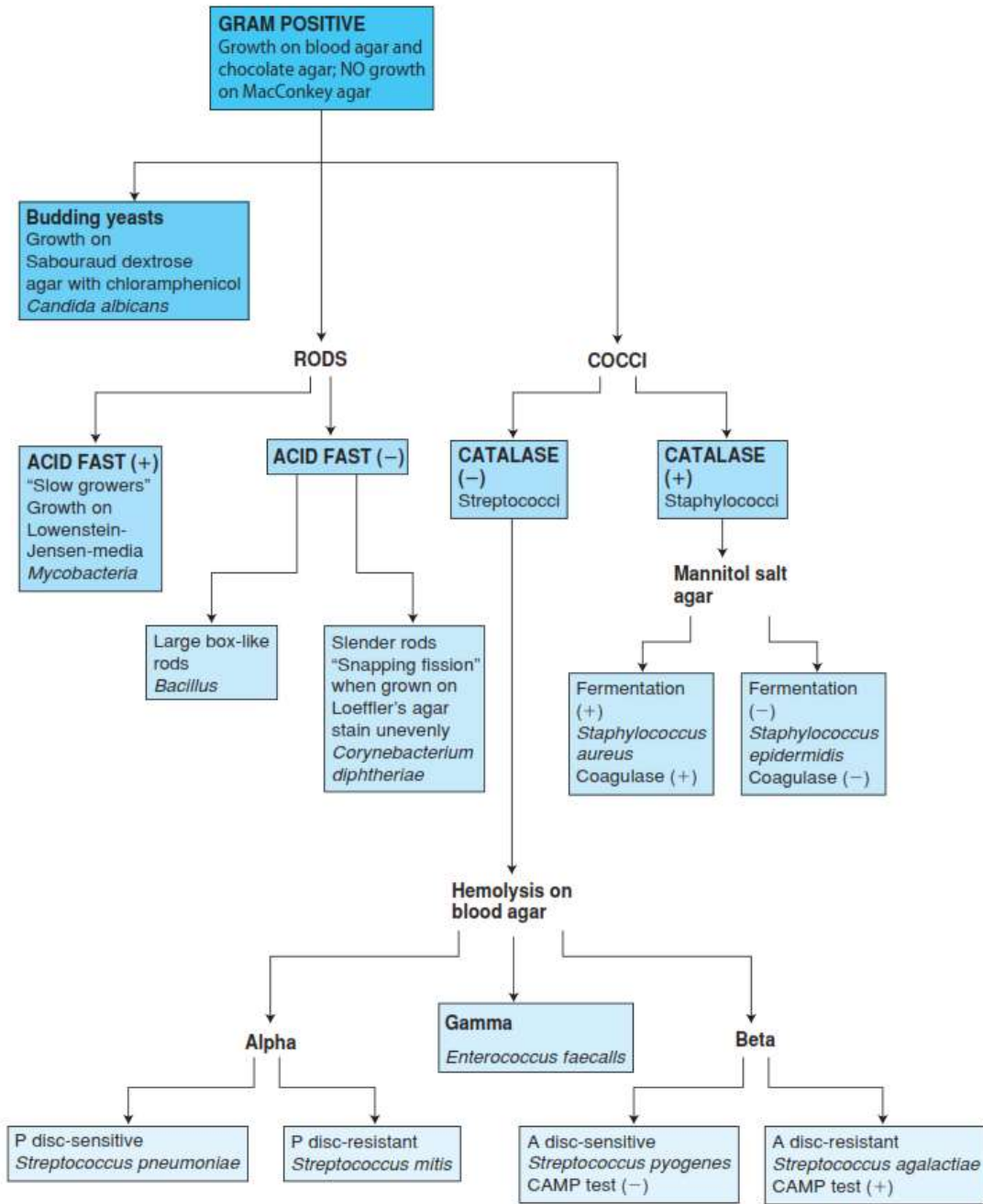
Figure 2-9. A patient with scarlet fever, showing the “strawberry tongue.” Image courtesy of the Centers for Disease Control and Prevention.

تشخیص آزمایشگاهی

TABLE A-2. Grouping Common Bacterial Pathogens by Gram-stain Reaction

Gram-positive Bacteria	Gram-negative Bacteria	Bacteria Usually <i>not</i> Gram-stained
<p>Aerobic gram-positive rods <i>Bacillus</i> <i>Corynebacterium</i> <i>Listeria</i></p>	<p>Gram-negative cocci <i>Neisseria</i> <i>Moraxella</i></p>	<p>Elementary body/reticulate body <i>Chlamydia</i> <i>Chlamydophila</i></p>
<p>Anaerobic spore-forming gram-positive rods <i>Clostridium</i></p>	<p>Enteric gram-negative rods <i>Escherichia</i> <i>Proteus</i> <i>Campylobacter</i> <i>Yersinia enterocolitica</i> <i>Salmonella</i> <i>Shigella</i> <i>Helicobacter</i> <i>Vibrio</i> <i>Bacteroides</i></p>	<p>Spirochetes <i>Borrelia</i> <i>Treponema</i></p>
<p>Gram-positive cocci <i>Staphylococcus</i> <i>Streptococcus</i> <i>Enterococcus</i></p>	<p>Nonenteric gram-negative rods <i>Haemophilus</i> <i>Legionella</i> <i>Francisella</i> <i>Pasteurella</i> <i>Brucella</i> <i>Pseudomonas</i> <i>Klebsiella</i> <i>Yersinia pestis</i></p>	<p>No cell wall <i>Mycoplasma</i> <i>Ureaplasma</i></p>
		<p>Unique cell wall <i>Mycobacterium</i></p>

IDENTIFICATION OF COMMON GRAM-POSITIVE BACTERIAL PATHOGENS (FIGURE A-1)



Gram Positive Cocci

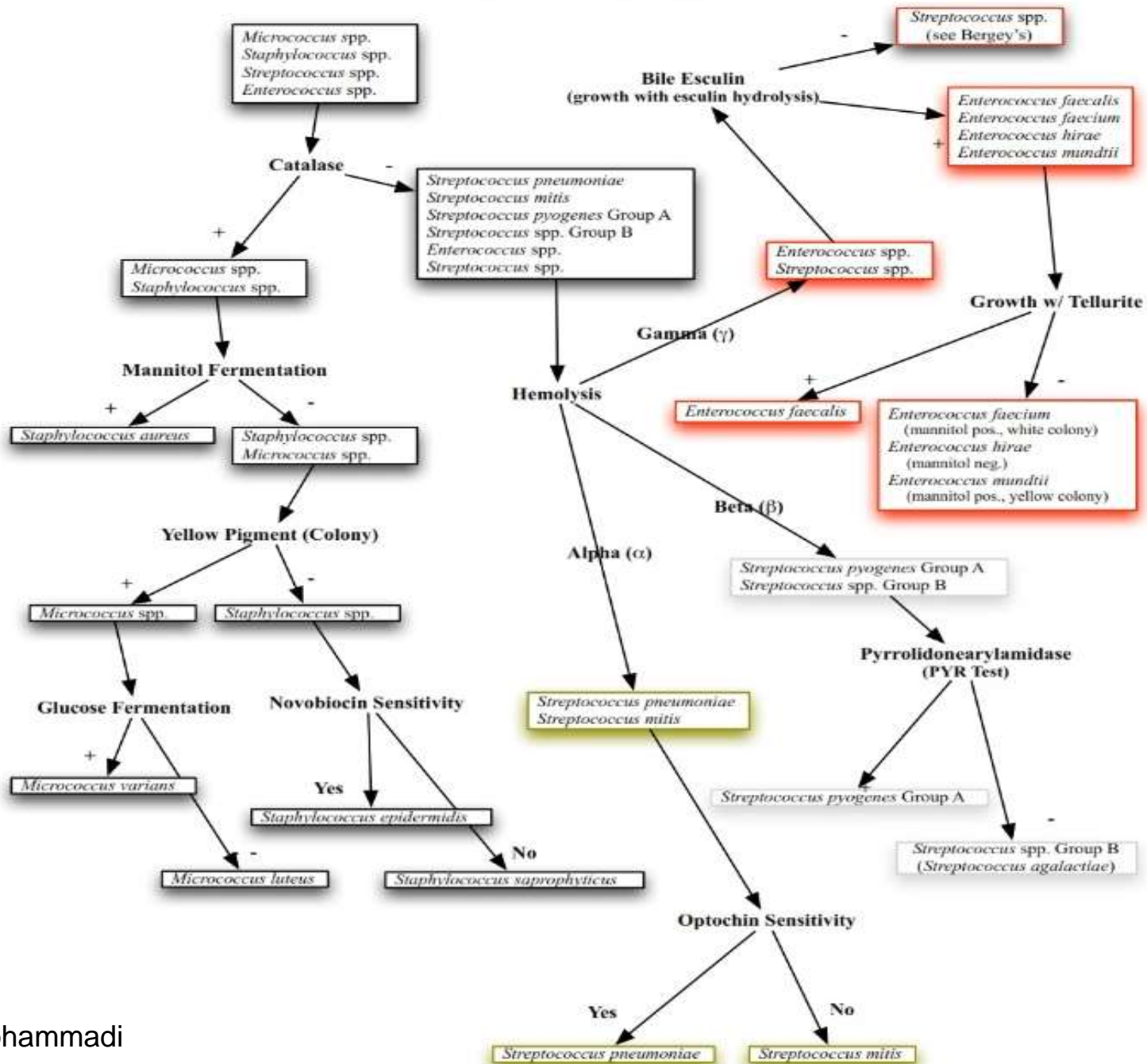




FIGURE 13-2 Colonies of *Staphylococcus aureus* on a blood agar plate after 24 hours incubation. The yellow-gray colonies are 3–4 mm in diameter on the 10-cm plate. The colonies are surrounded by clear zones of hemolysis about 1 cm in diameter. (Courtesy of H Reyes.)

TABLE 14-3 Differentiation Among Staphylococci and Other Gram-Positive Cocci

Characteristic	Staphylococci	Enterococci	Streptococci	Aerococci	Alloiococci	Planococci	Stomatococci	Macrococci	Micrococci	<i>Rothia</i>
Strict anaerobe	–	–	–	–	+	+	–	±	+	–
Facultative anaerobe	d	+	+	+	–	–	+	±	–	+
Motility	–	d	–	–	–	+	–	–	–	–
Growth on NaCl agar										
5% NaCl	+	+	d	+	+	+	–	+	+	–
6.5% NaCl	+	+	d	+	+	+	–	+	+	–
12% NaCl	d	(±)	–	+	ND	+	–	–	–	+
Catalase	+	–	–	–	±	+	±	+	+	±
Benzidine test	+	–	–	–	±	+	+	+	+	+
Anaerobic acid from glucose	d	+	+	(+)	ND	–	+	–	–	+
Lysostaphin (200 mg/mL)	–	+	+	+	ND	+	+	–	+*	+
Erythromycin (0.04-unit disk)	+	+	–	ND	ND	ND	ND	+	– [†]	ND
Bacitracin (0.04-unit disk)	+	+	d	–	ND	–	–	+	–	–

Modified from Bannerman TL: Staphylococcus, micrococcus, and other catalase: positive cocci that grow aerobically. In Murray PR et al, editors: *Manual of clinical microbiology*, ed 9, Washington, DC, 2007, ASM Press.

+, ≥90% species or strains positive; ±, ≥90% species or strains weakly positive; –, ≥90% species or strains negative; d, 11%-89% of species or strains positive; (), delayed reaction; NaCl, sodium chloride; ND, not determined.

*Some strains of *M. luteu*, *M. roseus*, and *M. sedentarius* demonstrate susceptibility to lysostaphin, presumably because of contaminating levels of endo-β-N-acetylglucosaminidase activity.

[†]A few *Micrococcus* strains demonstrate high-level (minimal inhibitory concentration ≥50 μg/mL) erythromycin resistance.

TABLE 14-5 Key Test for Identification of the Most Clinically Significant *Staphylococcus* Species

Test	<i>S. aureus</i>	<i>S. epidermidis</i>	<i>S. haemolyticus</i>	<i>S. lugdunensis</i>	<i>S. saprophyticus</i>	<i>S. schleiferi</i>	<i>S. simulans</i>
Colony pigment	+	-	d	d	d	-	-
Staphylocoagulase	+	-	-	-	-	-	-
Clumping factor	+	-	-	(+)	-	+	-
Heat-stable nuclease	+	-	-	-	-	+	-
Alkaline phosphatase	+	+*	-	-	-	+	(d)
Pyrrolidonyl arylamidase (PYR)	-	-	+	+	-	+	+
Ornithine decarboxylase	-	(d)	-	+	-	-	-
Urease	d	+	-	d	+	-	+
β -Galactosidase	-	-	(d)	-	+	(+)	+
Acetoin production	+	+	+	+	+	+	d
<u>Novobiocin resistance</u>	S	S	S	S	R	S	S
Polymyxin B resistance	R	R	S	(d)	S	S	S
Acid (aerobically from)							
D-Trehalose	+	-	+	+	+	d	d
D-Mannitol	+	-	-	-	d	-	+
D-Mannose	+	(+)	+	+	-	+	d
D-Turanose	+	(d)	(d)	(d)	+	-	-
D-Xylose	-	-	-	-	-	-	-
D-Cellubiose	-	-	-	-	-	-	-
Maltose	+	+	+	+	+	-	(\pm)
Sucrose	+	+	+	+	+	-	+

Modified from Bannerman TL: *Staphylococcus, micrococcus, and other catalase: positive cocci that grow aerobically*. In Murray PR et al, editors: *Manual of clinical microbiology*, ed 9, Washington, DC, 2007, ASM Press.

+, $\geq 90\%$ strains positive; \pm , $\geq 90\%$ strains weakly positive; -, $\geq 90\%$ strains negative; d, 11%-89% of strains positive; (d), delayed reaction; R, resistant; S, sensitive.

*A low but significant number (6%-15%) of clinical isolates are alkaline-phosphatase-negative.

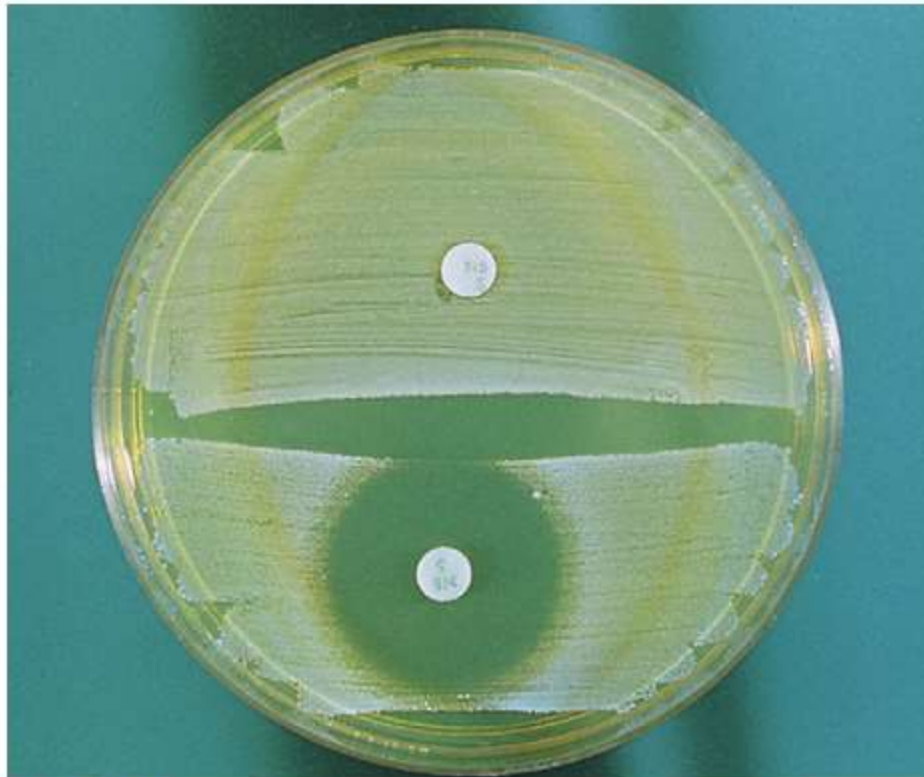


FIGURE 14-7 Novobiocin susceptibility test to differentiate coagulase-negative staphylococci (CoNS) isolated from urine samples. *Staphylococcus saprophyticus* (top) is resistant to novobiocin, indicated by the lack of a zone of inhibition around the disk.

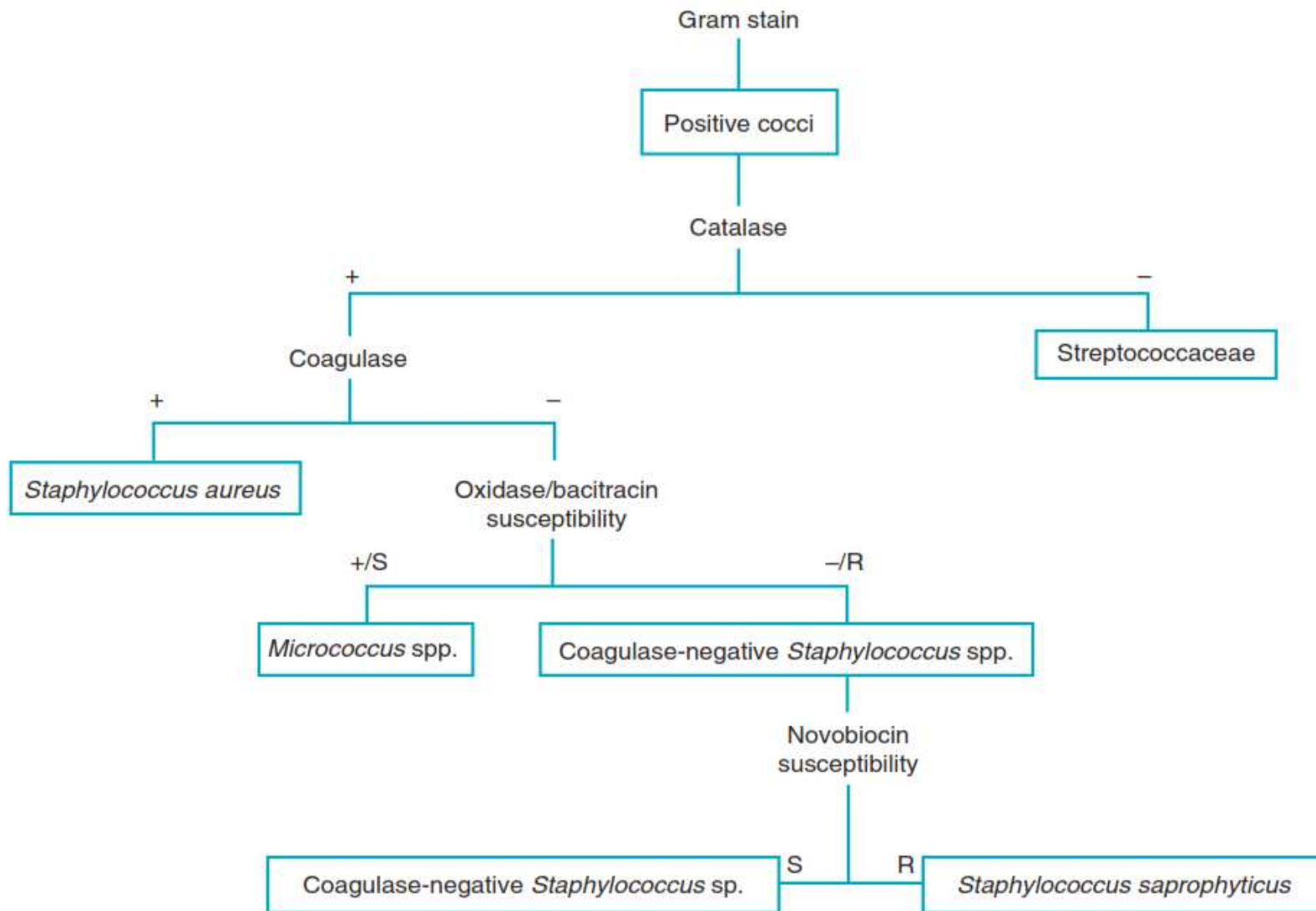


FIGURE 14-8 Schema for the identification of staphylococcal species. *Note:* Other *Staphylococcus* spp. that are coagulase-positive besides *S. aureus* include *S. schleiferi* and *S. lugdunensis* (which can be slide test positive), *S. intermedius*, and *S. hyicus* (tube-positive and slide-positive). *S*, Sensitive; *R*, Resistant.

THE PATHOGENIC STAPHYLOCOCCAL SPECIES

TABLE A-3. Laboratory Tests Used to Differentiate the Pathogenic Staphylococcal Species

Organism	Hemolysis on Blood Agar Plates	Catalase Production	Coagulase Production/ Mannitol Fermentation	Novobiocin Sensitivity
<i>Staphylococcus aureus</i>	Beta or gamma	Positive	Positive/ positive	Sensitive
<i>Staphylococcus epidermidis</i>	Gamma	Positive	Negative/negative	Sensitive
<i>Staphylococcus saprophyticus</i>	Gamma	Positive	Negative/negative	Resistant

TABLE 15-3 Biochemical Identification of *Streptococcus* and Similar Organisms

Characteristic	<i>S. pyogenes</i>	<i>S. agalactiae</i>	Other β -Hemolytic Species*	<i>Enterococcus</i>	Group D Streptococci	<i>S. pneumoniae</i>	Viridans Streptococci	<i>Aerococcus</i>	<i>Pediococcus</i>	<i>Leuconostoc</i>
Hemolysis type	β	β	β	α , β , none	α , none	α	α , none	α , none	α , none	α , none
Susceptibility to										
Vancomycin	S	S	S	S(R)	S	S	S	S	R	R
Bacitracin	S	R [†]	R [†]	R	R	S	R [†]	S		
SMZ	R	R	S	R	V	S	S			
Optochin	R	R	R	R	R	S	R			
Hydrolysis of										
Hippurate	-	+	-	- [†]	-	-	- [†]	+	+	-
PYR	+	-	-	+	-	-	-	+	-	-
CAMP	-	+	-	-	-	-	-	-	-	-
Leucine aminopeptidase	+	+	+	+	+	+	+	-	+	-
Bile esculin	-	-	-	+	+	-	- [†]	V	+	V
Growth in 6.5% NaCl	-	-	-	+	-	-	-	+	V	V

R, Resistant; S, susceptible; S(R), greater percentage susceptible; V, variable; +, present; -, absent; SMZ, sulfamethoxazole; PYR, pyrrolidonyl- α -naphthylamide.

* β -Hemolytic groups other than A, B, and D.

[†]Exceptions may occur.

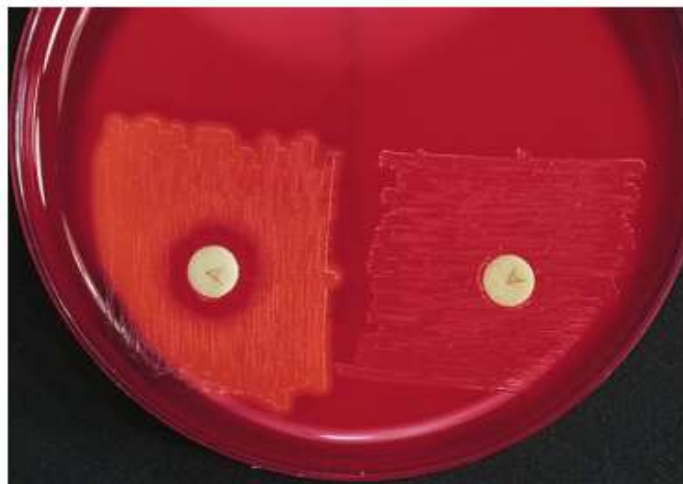
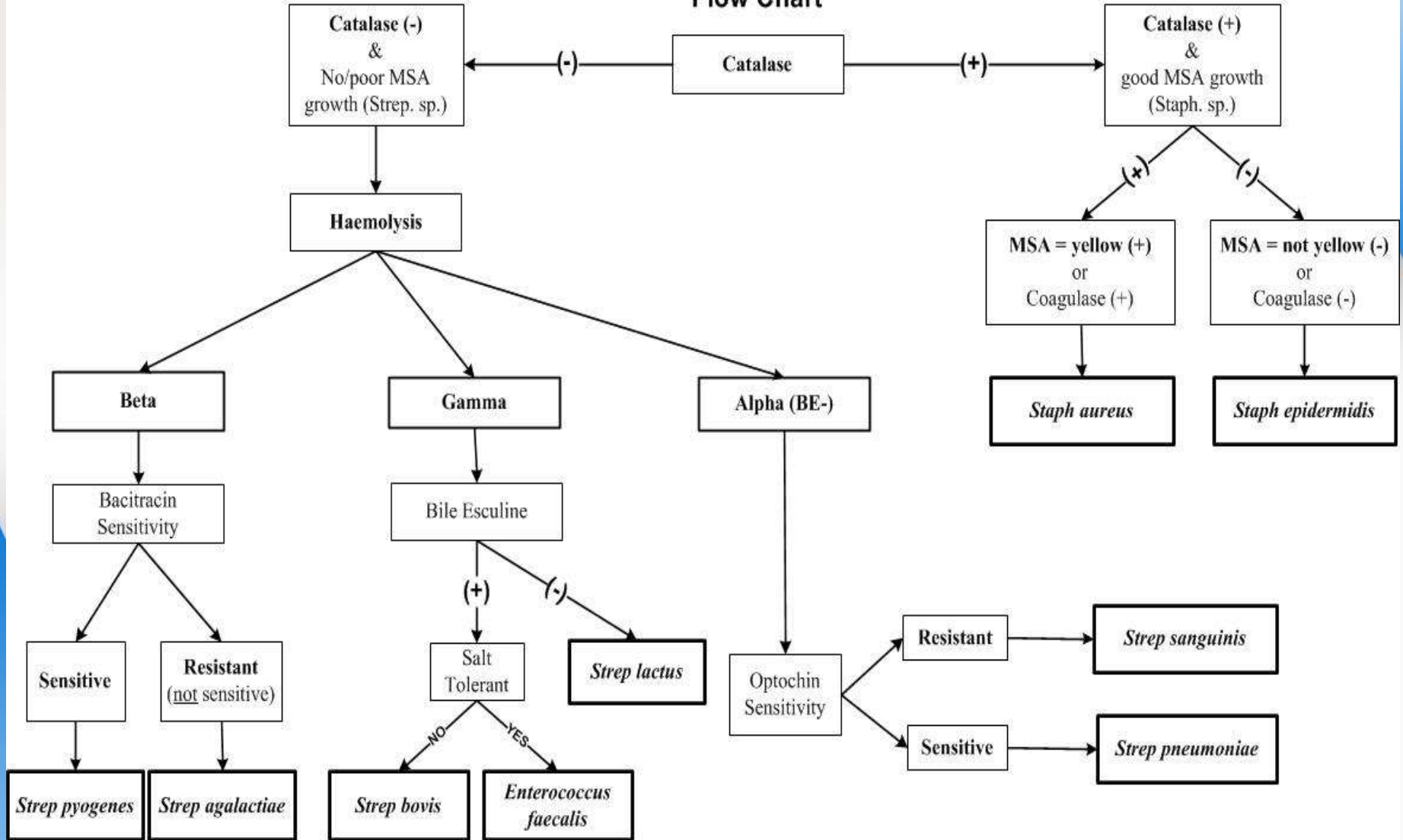


FIGURE 15-17 Group A streptococci on sheep blood agar (SBA) showing susceptibility to bacitracin. *Left*, Susceptible. *Right*, Resistant.



FIGURE 15-20 Pyrrolidonyl- α -naphthylamide (PYR) test for *Streptococcus pyogenes* and *Enterococcus*. *Left*, Negative. *Right*, Positive.

Gram Positive Coccus Flow Chart



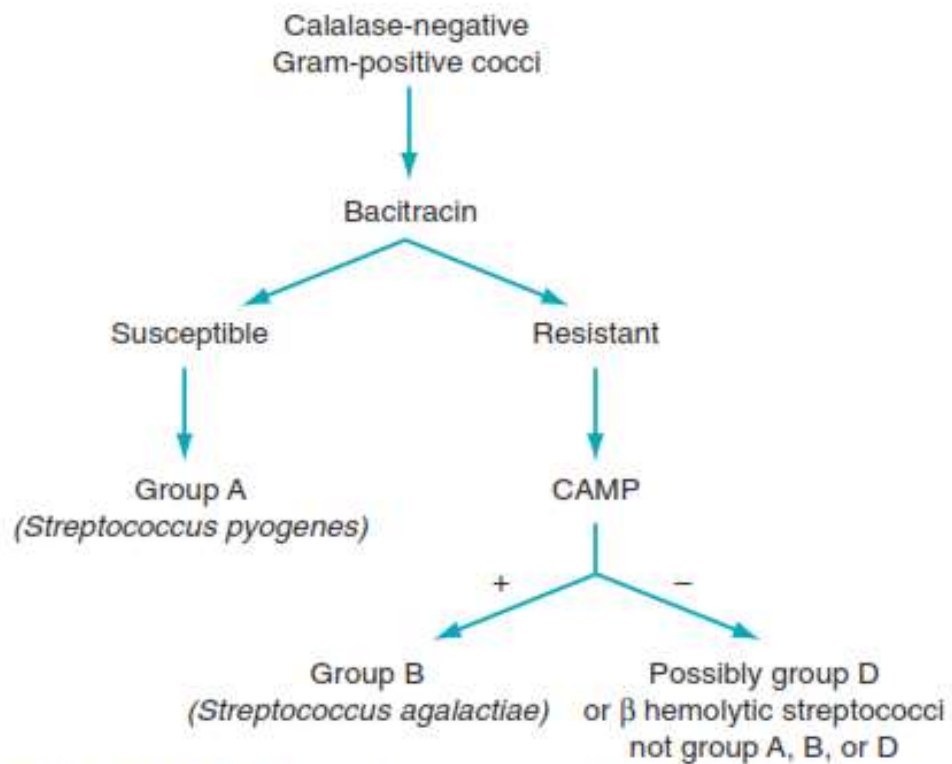


FIGURE 15-6 Schematic diagram for differentiation of group A streptococci (GAS) from group B streptococci (GBS).

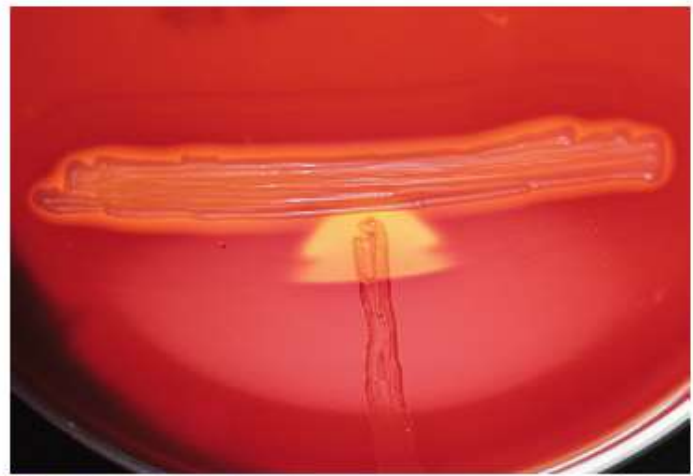


FIGURE 15-18 CAMP test for presumptive identification of group B streptococci (GBS). *Streptococcus agalactiae* shows the classic arrow shape near the streptococcal streak.



FIGURE 15-19 Modification of the CAMP test showing the enhanced hemolysis produced by *Streptococcus agalactiae* when a drop of extracted β-lysin is placed on the colony.

Dr A.Mohammadi

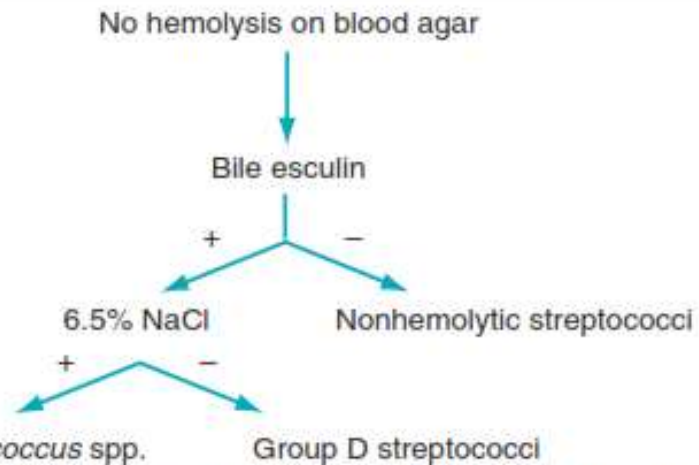


FIGURE 15-10 Schematic diagram for identification of nonhemolytic streptococci.

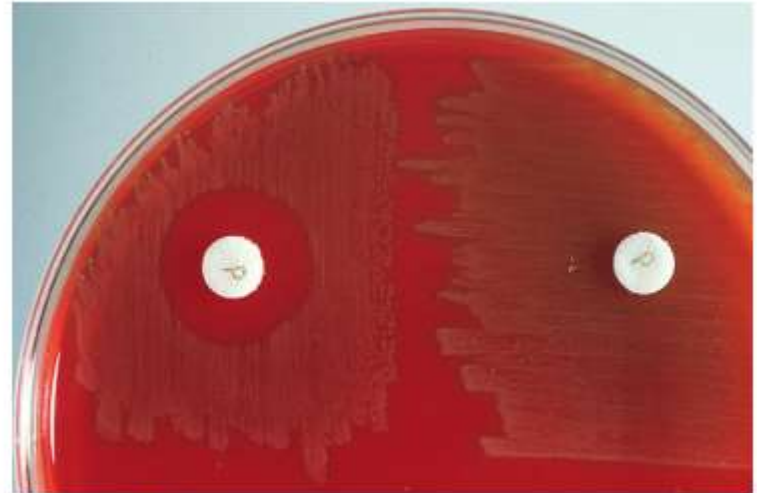


FIGURE 15-22 *Streptococcus pneumoniae* on blood agar showing susceptibility to optochin. Left, Susceptible *S. pneumoniae*. Right, Resistant viridans streptococci.



FIGURE 15-21 Bile esculin test. Left, Positive test shows blackening of the agar. Right, Negative test.

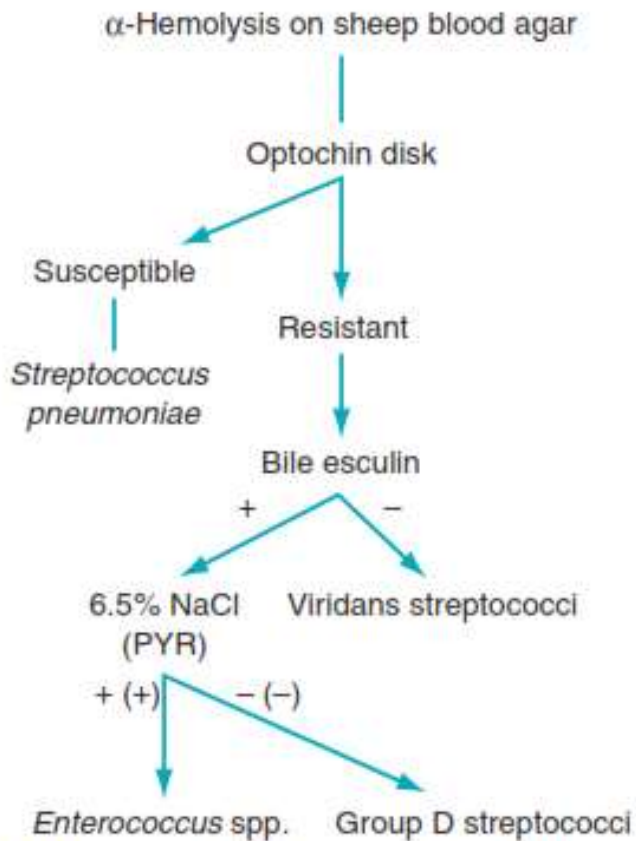


FIGURE 15-11 Schematic diagram for differentiation of α-hemolytic streptococci from *Enterococcus*.

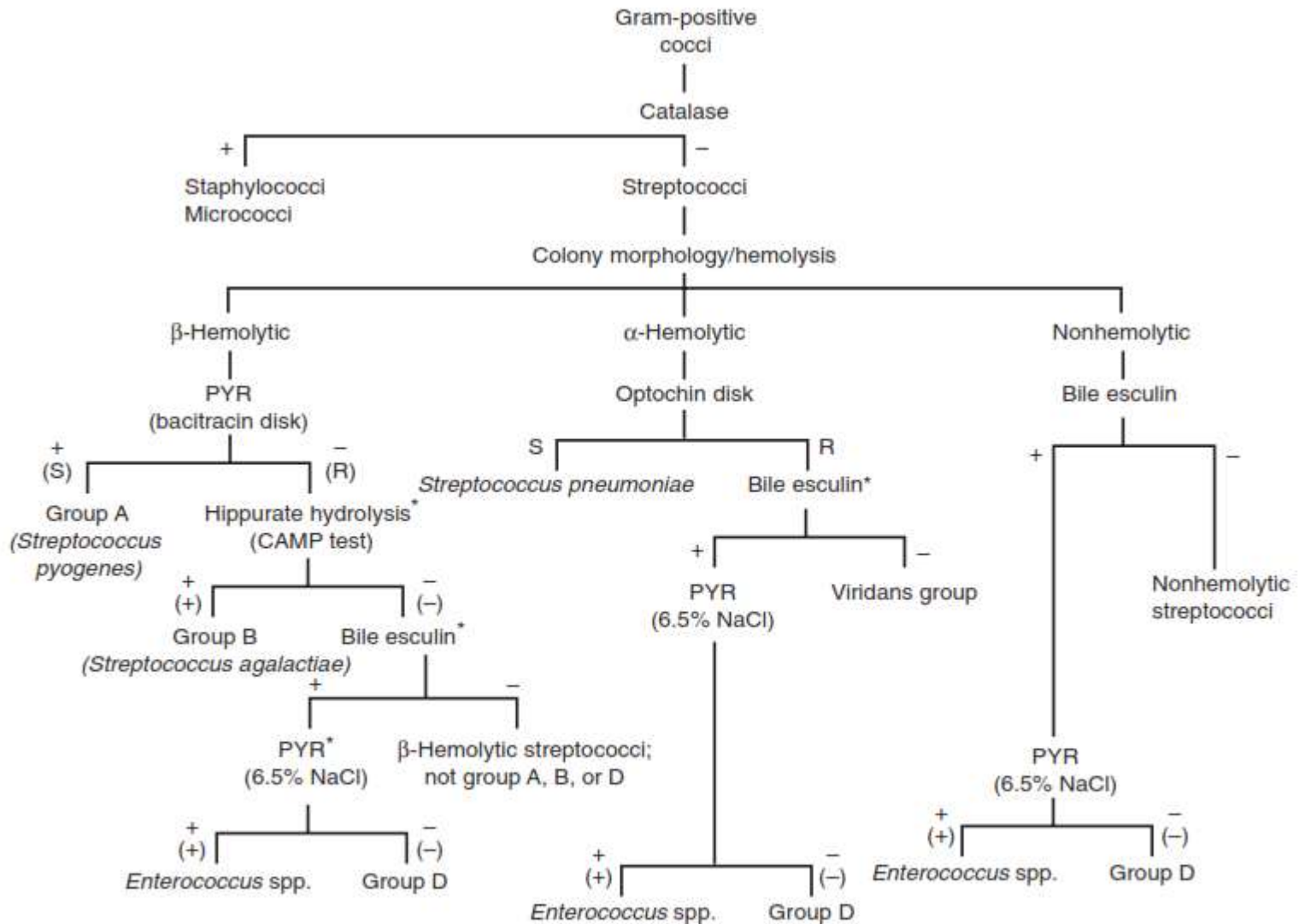


FIGURE 15-22 *Streptococcus pneumoniae* on blood agar showing susceptibility to optochin. Left, Susceptible *S. pneumoniae*. Right, Resistant viridans streptococci.



FIGURE 15-21 Bile esculin test. Left, Positive test shows blackening of the agar. Right, Negative test.

Dr A.Mohammadi



*Perform additional tests if isolate is from nonrespiratory source.

FIGURE 15-15 Schematic diagram for the presumptive identification of gram-positive cocci. R, Resistant; S, susceptible.

PATHOGENIC STREPTOCOCCAL SPECIES

TABLE A-4. Laboratory Tests Used to Differentiate the Pathogenic Streptococcal Species

Organism	Lancefield Grouping	Hemolysis* on Blood Agar Plates	Biochemical Tests
<i>S pyogenes</i>	A	Beta	Sensitive to bacitracin (A disc)
<i>S agalactiae</i>	B	Beta usually; gamma sometimes	Positive CAMP-test; hippurate hydrolysis
<i>S pneumoniae</i>	Nongroupable; Viridans group	Alpha	Soluble in bile; sensitive to Optochin (P disc)

CAMP, Christie, Atkinson, Munch, Peterson.

*There are three different types of hemolysis. **Alpha hemolysis** is not really hemolysis of the erythrocytes in the blood agar plates but rather a conversion of hemoglobin to a form of hemoglobin that appears green in the agar around the bacterial colony. **Beta hemolysis** is true hemolysis with actual lysis of the erythrocytes in the blood agar around the bacterial colony. **Gamma hemolysis** is not really a hemolytic event either. The organism is gamma hemolytic when no lysis of the erythrocytes or color change occurs in the media around the colony. In other words, these organisms are nonhemolytic.



FIGURE 14-2 Group A β -hemolytic streptococci (*Streptococcus pyogenes*) after growth overnight on a 10-cm plate with 5% sheep blood agar. The small (0.5–1 mm diameter) white colonies are surrounded by diffuse zones of β -hemolysis 7–10 mm in diameter. (Courtesy of H Reyes.)

TABLE 14-1 Characteristics of Medically Important Streptococci

Name	Group-Specific Substance ^a	Hemolysis ^b	Habitat	Important Laboratory Criteria	Common and Important Diseases
Pyogenic Streptococci					
<i>Streptococcus pyogenes</i>	A	β	Throat, skin	Large colonies (>0.5 mm), PYR ^c test positive, inhibited by bacitracin	Pharyngitis, impetigo, deep soft tissue infections; bacteremia; rheumatic fever, glomerulonephritis, toxic shock
<i>Streptococcus agalactiae</i>	B	β	Urogenital tract, lower GI tract	Hippurate hydrolysis, CAMP-factor positive ^d	Neonatal sepsis and meningitis; bacteremia, UTIs, ^e meningitis in adults
<i>Streptococcus dysgalactiae</i> subspecies <i>equisimilis</i> ; others	C, G	β (human infections), α, none	Throat	Large (>0.5 mm) colonies	Pharyngitis, pyogenic infections similar to group A streptococci
Viridans Streptococci					
<i>Streptococcus bovis</i> group ^f	D	None	Colon, biliary tree	Growth in presence of bile, hydrolyze esculin, no growth in 6.5% NaCl, degrades starch	Endocarditis, common blood isolate in colon cancer, biliary disease
<i>Streptococcus anginosus</i> group (<i>S. anginosus</i> , <i>Streptococcus intermedius</i> , <i>Streptococcus constellatus</i>)	F (A, C, G) and untypeable	α, β, none	Throat, colon, urogenital tract	Small (<0.5 mm) colony variants of β-hemolytic species; group A are bacitracin resistant and PYR negative; carbohydrate fermentation patterns; arginine, esculin, VP ^g positive	Pyogenic infections, including brain, liver, lung abscesses
Mutans group	Usually not typed	α, none	Oral cavity	carbohydrate fermentation patterns; esculin, VP positive	Dental caries (<i>S. mutans</i>), endocarditis; abscesses (with many other bacterial species)
Mitis-Sanguinis group					
<i>Streptococcus pneumoniae</i>	None ^o	α	Nasopharynx	Susceptible to optochin; colonies soluble in bile; quellung reaction positive	Pneumonia, meningitis, bacteremia, otitis media, sinusitis
<i>Streptococcus mitis</i>	None	α, none	Oral cavity	VP negative ^o ; carbohydrate fermentation patterns	Endocarditis; bacteremia, sepsis in immunocompromised patients; high-level resistance to penicillin
Salivarius group	None	α, none	Oral cavity	VP positive; carbohydrate fermentation patterns	Bacteremia, endocarditis, meningitis

TABLE 15-4 Characteristics of Viridans Streptococci*

	Mannitol	Sorbital	Voges-Proskauer	Hydrolysis of Arginine	Hydrolysis of Esculin	Urease	Hemolytic Pattern
Anginosus group	-/v	-	+	+	+	-	α , β , Non
Bovis group	v	-	+	-	+	-	α , Non
Mitis group	-	-/v	-	v	v	-	α
Mutans group	+	+	+	-	+	-	α , β , Non
Salvarius group	-	-	+/v	-	+/v	+/v	α

Data from Spellerberg B, Brandt C. In Versalovic J, et al, editors: *Manual of clinical microbiology*, ed 10, Washington, DC, 2011, ASM Press.

+, Positive test result; -, negative test result; v, variable test result; Non, nonhemolytic.

*All viridans streptococci species are leucine aminopeptidase-positive and pyrrolidonyl- α -naphthylamide-negative.























































TABLE 15-5 Phenotype and Biochemical Characteristics of Enterococcal Species

<i>Enterococcus</i> Species	MOT	MAN	SOR	ARA	RAF	TEL	ARG	PYU	MGP
<i>E. faecalis</i>	–	+*	–	–	–	+	+*	+	–
<i>E. faecium</i>	–	+*	–	+	V	–	+	–	–
<i>E. durans</i>	–	–	–	–	–	–	+	–	–
<i>E. avium</i>	–	+	+	+	–	–	–	+	+
<i>E. casseliflavus</i>	+*	+	–	+	+	–*	+*	V	+
<i>E. gallinarum</i>	+*	+*	–	+	+	–	+*	–	+
<i>E. raffinosus</i>	–	+	+	+	+	–	–	+	+

Data from Teixeira LM, et al: *Enterococcus*. In Versalovic J, et al, editors: *Manual of clinical microbiology*, ed 10, Washington, DC, 2011, ASM Press. ARA, arabinose; ARG, arginine; MAN, mannitol; MGP, methyl α -D-glucopyranoside; MOT, motility; PYU, pyruvate; RAF, raffinose; SOR, sorbose; TEL, tellurite; V, variable test; +, positive test; –, negative test. *Occasional exceptions occur.

REMEL/IDS Rapid STR Color Guide



Test	Cavity	Positive Reactions	Negative Reactions
ARG	1	 	 
ESC	2		  
MNL	3	 	 
SBL	4	 	 
RAF	5	 	
INU	6	 	
GAL	7		 
GLU	8		 
NAG	9		 
PO4	10		 
TYR	7	 	  
HPR	8	 	  
LYS	9	 	  
PYR	10	 	  

Without the addition of any reagents, read cavities 1-10 and record results:

Cavity 1: Development of a red or dark orange color is a positive test; a yellow or yellow-orange color is a negative test.

Cavity 2: Development of a black color is a positive test; a clear, tan, or a light brown color is a negative test.

Cavities 3-5: Development of a yellow or yellow-orange color is a positive test; a red or orange color is a negative test.

Cavity 6: Development of a yellow or orange color is a positive test; a red color is a negative test.

Cavities 7-10: Development of a significant yellow color is a positive test; a very pale or clear color is a negative test.

Add Rapid STR Reagent to cavities 7-10. Allow at least 30 seconds but no longer than 3 minutes for color development.

Cavities 7-8: Development of a purple color, without regard to intensity, is a positive test; a clear, tan, or yellow color is a negative test.

Cavities 9-10: Development of a very dark purple color is a positive test; a light to medium purple color is a negative test.

Note: The Rapid Color Guides are intended as an educational aid to be used in conjunction with the Technical Insert for the product. The reaction colors shown in the charts represent the typical shades of positive and negative colors.

800-447-3641 or 800-225-5443
(Technical Service)

PRINTED IN U.S.A. 3/98

FIGURE 15-16 Rapid STR panel for the identification of *Streptococcus* spp. **A**, Commercial test well cartridge containing appropriate substrates. **B**, Interpretive color guide to reactions. (Courtesy Remel, Lenexa, KS.)

مواد و روش ها

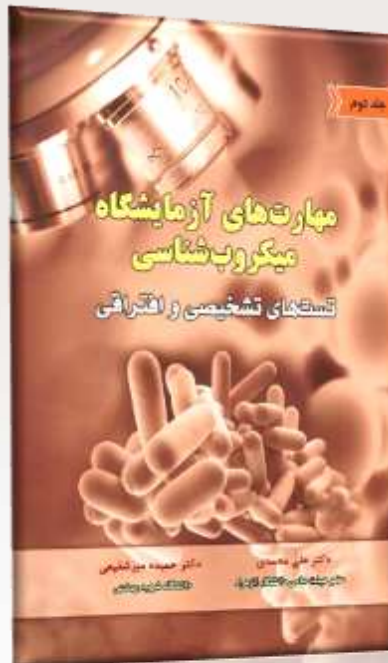
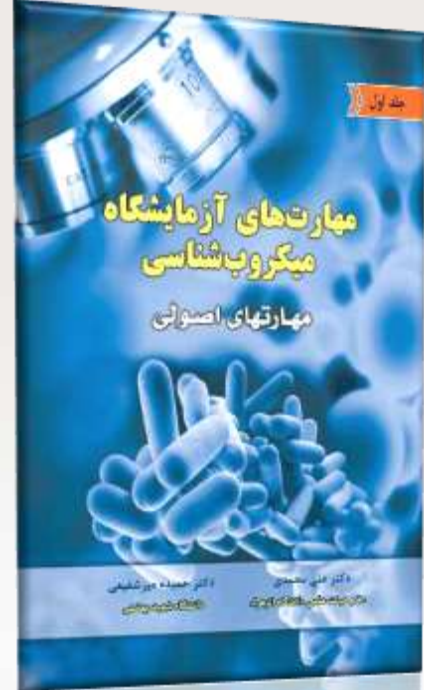
ردیف	مواد لازم:	
۱	سواپ	۶ لام و روغن امرسیون
۲	لوپ	۷ سرم فیزیولوژی
۳	محیط ها: NA , MSA , BA , نیترات آگار, بایل اسکولین آگار , MHA	۸ کیت رنگ آمیزی گرم
۴	معرف تست کاتالاز	۹ NB 6.5% NaCl
۵	دیسک باسیتراسین اپتوچین و نوویوسین	۱۰ محیط هیپورات و معرف های مربوطه
		۱۱ پلاسما خرگوش جهت تست کوآگولاز

نمونه گیری.

- (۱) سواب را در سرم فیزیولوژی قرار داده و مرطوب نمایید.
- (۲) ابتدا با کمک سواب از سطح پوست در اطراف بینی که مرطوب و چرب بوده و احتمال وجود میکروارگانیسم ها در آن زیاد است نمونه برداشته می شود. (در صورت وجود آبسه یا عفونت پوستی طبق دستورالعمل خاصی از این موارد نمونه ی خود را تهیه نمایید.)

ادامه.

- (۱) نمونه به محیط های بلاد آگار و نوترین آگار منتقل و به صورت ۳-۲ منطقه ای کشت شود.
- (۲) از نمونه ی بالینی یک لام گرم تهیه نمایید.
- (۳) با توجه به نتایج مراحل بالا برای تعیین جنس (استرپتوکوک یا استافیلوکوک) و گونه ی باکتری ها مراحل بعد را طی نمایید.



منابع:

- **مهارت های آزمایشگاه میکروپوشناسی** ، جلد ۱- ۳
- دکتر علی محمدی-عضو هیئت علمی دانشگاه الزهرا (س).
- دکتر حمیده میرشفیعی - دانشگاه شهید بهشتی
- Mahon, C. R., Lehman, D. C., & Manuselis, G. (2018). *Textbook of Diagnostic Microbiology-E-Book*. Elsevier Health Sciences.
- Tille, P. (2016). *Bailey & Scott's Diagnostic Microbiology-E-Book*. Elsevier Health Sciences.
- Chamberlain, N. (2008). *Medical microbiology: The big picture*. McGraw Hill Professional.
- Carroll, K. C., Butel, J., & Morse, S. (2016). *Jawetz Melnick & Adelbergs Medical Microbiology 27 E*. McGraw Hill Professional.