










- 1  **Chapter 21**  
Microbial Diseases of the Skin and Eyes
- 2  **The Structure of Human Skin**
  - Perspiration and sebum contain nutrients
  - Salt inhibits microbes
  - Lysozyme hydrolyzes peptidoglycan
  - Fatty acids inhibit some pathogens
- 3  **Mucous Membranes**
  - Line body cavities
  - The epithelial cells are attached to an extracellular matrix
  - Cells secrete mucus
  - Often acidic
  - Some cells have cilia
  - In eyes, washed by tears with lysozyme
- 4  **Normal Microbiota of the Skin**
  - Gram-positive, salt-tolerant bacteria
    - Staphylococci
    - Micrococci
    - Diphtheroids
- 5  **Normal Microbiota of the Skin**
  - Grow on oils
  - Aerobes on surface
    - *Corynebacterium xerosis*
  - Anaerobes in hair follicles
    - *Propionibacterium acnes*
  - Yeast
    - *Malassezia furfur*
  -
- 6  **Microbial Diseases of the Skin**
  - Exanthem: Skin rash arising from another focus of the infection
  - Enanthem: Mucous membrane rash arising from another focus of the infection
- 7  **Skin Lesions**
- 8  **Bacterial Diseases of the Skin**
- 9  **Staphylococcal Skin Infections**
  - *Staphylococcus epidermidis*
    - Gram-positive cocci, coagulase-negative
  - *Staphylococcus aureus*
    - Gram-positive cocci, coagulase-positive
- 10  ***Staphylococcus aureus***
  - Antibiotic resistant
  - Leukocidin
  - Resists opsonization
  - Survives in phagolysosome
  - Lysozyme resistant
  - Exfoliative toxin

- Superantigen
- 11  **Staphylococcal Biofilms**
- 12  **Staphylococcal Skin Infections**
  - Folliculitis: Infections of the hair follicles
  - Sty: Folliculitis of an eyelash
  - Furuncle: Abscess; pus surrounded by inflamed tissue
  - Carbuncle: Inflammation of tissue under the skin
  - Impetigo: crusting (nonbullous) sores, spread by autoinoculation
- 13  **Nonbullous Lesions of Impetigo**
- 14  **Scalded Skin Syndrome**
  - Toxic shock syndrome (TSS)
    - Toxic shock syndrome toxin 1
  - Scalded skin syndrome
    - Bullous impetigo
    - Impetigo of the newborn
  -
- 15  **Lesions of Skin Syndrome**
- 16  **Streptococcal Skin Infections**
  - *Streptococcus pyogenes*
  - Group A beta-hemolytic streptococci
  - Hemolysins
  - Hyaluronidase
  - Stretolysins
  - M proteins
- 17
- 18  **Streptococcal Skin Infections**
  - Necrotizing fasciitis
  - Erysipelas
  -
- 19  **Invasive Group A Streptococcal Infections**
  - Exotoxin A, superantigen
- 20  **Streptococcal Toxic Shock Syndrome**
  - M proteins
  - Complex with fibrinogen
  - Binds to neutrophils
  - Activates neutrophils
  - Release of damaging enzymes
  - Shock and organ damage
- 21  **Infections by Pseudomonads**
  - *Pseudomonas aeruginosa*
    - Gram-negative, aerobic rod
    - Pyocyanin produces a blue-green pus
  - *Pseudomonas dermatitis*
  - Otitis externa, or "swimmer's ear"
  - Post-burn infections
  - Opportunistic

- 22  **Buruli Ulcer**
- Caused by *Mycobacterium ulcerans*
  - Deep, damaging ulcers
  - Exceeds incidence of leprosy
- 23  **Classifications of Acne**
- Comedonal (mild) acne
  - Inflammatory (moderate) acne
  - Nodular cystic (severe) acne
- 24  **Comedonal Acne**
- Mild
    - Sebum channels blocked with shed cells
  - Treatment
    - Topical agents
    - Salicylic acid preparations
    - Retinoids
    - Adapalene
- 25  **Inflammatory Acne**
- *Propionibacterium acnes*
    - Gram-positive, anaerobic rod
  - Treatment
    - Preventing sebum formation (isotretinoin)
    - Antibiotics
    - Benzoyl peroxide to loosen clogged follicles
    - Visible (blue) light (kills *P. acnes*)
- 26  **Nodular Cystic Acne**
- Severe
  - Treatment
    - Isotretinoin
- 27  **Viral Diseases of the Skin**
- 28  **Warts**
- Papillomaviruses
    - Treatment
      - Removal
        - Cryotherapy
        - Electrodesiccation
        - Salicylic acid
      - Imiquimod (stimulates interferon production)
      - Bleomycin
- 29  **Poxviruses**
- Smallpox (variola)
    - Smallpox virus (orthopox virus)
      - Variola major has 20% mortality
      - Variola minor has <1% mortality
    - Eradicated by vaccination
  - Monkeypox
    - Prevention by smallpox vaccination
- 30  **Smallpox Lesions**

31  **Chickenpox**

- Varicella-zoster virus (human herpesvirus 3)
- Transmitted by the respiratory route
- Causes pus-filled vesicles
- Virus may remain latent in dorsal root ganglia
- Prevention: Live attenuated vaccine
- Breakthrough varicella in vaccinated people

32 33  **Shingles**

- Reactivation of latent HHV-3 releases viruses that move along peripheral nerves to skin
- Postherpetic neuralgia
- Prevention: Live attenuated vaccine
- Acyclovir may lessen symptoms

34 35  **Herpes Simplex**

- *Human herpesvirus 1* (HSV-1) and 2 (HSV-2)
- Cold sores or fever blisters (vesicles on lips)
- Herpes gladiatorum (vesicles on skin)
- Herpetic whitlow (vesicles on fingers)
- Herpes encephalitis
- HSV-1 can remain latent in trigeminal nerve ganglia

36  **Cold Sores Caused by Herpes Simplex Virus**37  **HSV-1 in the Trigeminal Nerve Ganglion**38  **Herpes Simplex**

- HSV-2 can remain latent in sacral nerve ganglia
- HSV-2 encephalitis: 70% fatality
- Encephalitis treatment: Acyclovir

39  **Measles (Rubeola)**

- Measles virus
- Transmitted by respiratory route
- Macular rash and Koplik's spots
- Prevented by vaccination

40  **Measles (Rubeola)**

- Encephalitis in 1 in 1,000 cases
- Subacute sclerosing panencephalitis in 1 in 1,000,000 cases

41  **Reported U.S. Cases of Measles, 1960–2007**42  **Rubella (German Measles)**

- Rubella virus
- Macular rash and fever
- Congenital rubella syndrome causes severe fetal damage
- Prevented by vaccination

43  **Fifth Disease**

- Name derived from a 1905 list of skin rashes, which included
  - 1. Measles

- 2. Scarlet fever
- 3. Rubella
- 4. Filatov Dukes disease (mild scarlet fever), and
- 5. Fifth disease, or erythema infectiosum
  - Human parvovirus B19 produces mild flu-like symptoms and facial rash

44  **Roseola**

- Caused by human herpesvirus 6 (HHV-6) and 7 (HHV-7)
- High fever and rash lasting for 1–2 days

45  **Fungal Diseases of the Skin and Nails**46  **Cutaneous Mycoses**

- Dermatomycoses
  - Also known as *tineas* or *ringworm*
  - Metabolize keratin

47  **Dermatomycoses**48  **Cutaneous Mycoses**

- Genera of fungi involved
  - *Trichophyton*: Infects hair, skin, and nails
  - *Epidermophyton*: Infects skin and nails
  - *Microsporum*: Infects hair and skin
- Treatment
  - Topical miconazole
  - Topical allylamine

49  **Cutaneous Mycoses**

- Tinea unguium
- Treatment
  - Itraconazole
  - Terbinafine

50  **Subcutaneous Mycoses**

- More serious than cutaneous mycoses
- Sporotrichosis
  - Most common U.S. disease of this type
  - *Sporothrix schenckii* enters puncture wound
  - Treated with potassium iodide (KI)

51  **Candidiasis**

- *Candida albicans* (yeast)
- Candidiasis may result from suppression of competing bacteria by antibiotics
- Occurs in skin and mucous membranes of genitourinary tract and mouth
- Thrush: An infection of mucous membranes of mouth
- Topical treatment with miconazole or nystatin

52  ***Candida albicans***53  **Case of Oral Candidiasis**54  **Systemic Candidiasis**

- Fulminating disease can result in immunosuppressed individuals
- Treatment: Fluconazole

55  **Parasitic Infestation of the Skin**

56  **Scabies**

- *Sarcoptes scabiei* burrows in the skin to lay eggs
- Treatment with topical insecticides

57  **Pediculosis (Lice)**

- *Pediculus humanus capitis* (head louse)
- *P. h. corporis* (body louse)
  - Feed on blood
  - Lay eggs (nits) on hair
  - Treatment with topical insecticides

58  **Diseases in Focus:****Patchy Redness and Pimple-Like Conditions**

- An 11-month-old boy came to clinic with a 1-week history of an itchy red rash under his arms. He seemed more bothered at night and had no fever.
- Can you identify infections that could cause these symptoms?

59  **Microbial Diseases of the Eye**60  **Bacterial Diseases of the Eye**

- Conjunctivitis
  - An inflammation of the conjunctiva
  - Also called pinkeye or red eye
  - Commonly caused by *Haemophilus influenzae*
  - Various other microbes can also be the cause
  - Associated with unsanitary contact lenses

61  **Bacterial Diseases of the Eye**

- Ophthalmia neonatorum
  - Caused by *Neisseria gonorrhoeae*
  - Transmitted to a newborn's eyes during passage through the birth canal
  - Prevented by treating a newborn's eyes with antibiotics

62  **Bacterial Diseases of the Eye**



- *Chlamydia trachomatis*
  - Causes inclusion conjunctivitis, or chlamydial conjunctivitis
  - Transmitted to a newborn's eyes during passage through the birth canal
  - Spread through swimming pool water
  - Treated with tetracycline

63  **Bacterial Diseases of the Eye**

- *Chlamydia trachomatis*
  - Causes trachoma
  - Leading cause of blindness worldwide
  - Infection causes permanent scarring; scars abrade the cornea leading to blindness

64  **Trachoma**65  **Trachoma**66  **Other Infectious Diseases of the Eye**

- Keratitis
  - Inflammation of the cornea
  - Bacteria (U.S.)
  - *Fusarium* and *Aspergillus* (Africa and Asia)

- 67  **Other Infectious Diseases of the Eye**
- Herpetic keratitis
    - Caused by herpes simplex virus 1 (HSV-1).
    - Infects cornea and may cause blindness
    - Treated with trifluridine
- 68  **Other Infectious Diseases of the Eye**
- *Acanthamoeba* keratitis
    - Transmitted via water
    - Associated with unsanitary contact lenses