Microbiology

Microbial Diseases of the Skin and Eyes

Anatomy of the skin

- The *stratum corneum* is essentially impenetrable
- The *epidermis* is self-renewing
- The *dermis* contains numerous tissues
  - Sweat glands convey perspiration, which maintains a hypertonic environment
  - Oil glands secrete sebum, a mixture of lipids and proteins
  - Hair follicles provide anaerobic pockets

Skin normal flora

- *Staphylococcus epidermidis*, *S. aureus*, and *Micrococcus* species are abundant
- *Corynebacterium* species, “diphtheroids”
- *Propionibacterium acnes* - an anaerobe that inhabits hair follicles
**Staphylococcus aureus** skin infections

- *Folliculitis* - Infection of hair follicles
  - *Pimples* - superficial infection
  - *Furuncles* - abscesses with inflamed tissue
  - *Carbuncles* - deep tissue damage
- *Impetigo of the newborn*
- *S. aureus toxemias* - systemic distribution of toxins
  - *Scalded skin syndrome*
  - *Toxic shock syndrome*
- Most isolates of *S. aureus* are penicillinase producers

**Streptococcus** skin infections

- Most significant are β-hemolytic streptococci
- *Impetigo*
- *Erysipelas* resulting from action of streptococcal toxins spread through the lymphatic system
- Streptococci reaching deeper tissues may cause *cellulitis, myositis*, and *necrotizing fasciitis*

**Pseudomonas** infections

- Usually *P. aeruginosa*
- *Pseudomonas dermatitis* may be acquired from contaminated water
- *Otitis externa*, “swimmer’s ear”, is often a *Pseudomonas* infection
- *P. aeruginosa* is a prominent opportunistic pathogen
  - Major pathogen in respiratory tract infection of cystic fibrosis patients
  - Burn infection
**Papillomavirus**

- Very common viral skin infection
- Infection and transformation of epidermis
- Most infections are benign, but genital papillomavirus infection is associated with risk for cervical carcinoma

**Smallpox**

- Two forms
  - *Variola major*
  - *Variola minor*
- Factors contributing to eradication
  - Variola infected only humans; no nonhuman reservoir
  - Smallpox was always apparent; no carriers
  - The *vaccinia* vaccine was very effective and very stable

**Varicella Zoster Virus (VSV)**

- Acute infection, with respiratory portal of entry, leads to *chicken pox* (varicella)
- Virus achieves latency in peripheral nerves
- Reactivation leads to *shingles* (zoster)
**Herpes Simplex Virus (HSV)**

- Another member of the herpesvirus family
- Etiologic agent of
  - Cold sores
  - Genital herpes
- Achieves latency in basal ganglia
- Severity of reactivation can be controlled by antiviral drugs acyclovir and gancyclovir

**Viruses causing skin rashes**

- **Rubeola virus**
  - Agent of measles
  - Along with smallpox and plague, a major cause of death in human history
- **Rubella virus**
  - Agent of “German measles”
  - Primary infection during pregnancy can lead to *congenital rubella syndrome*
- Skin rash is a hypersensitivity response
- Both viruses are controlled by vaccination

**Control of measles by vaccination**

[Sources: CDC, Summary of Notifiable Diseases 1996, MMWR 47(33) (12/29/98); MMWR 48(51) (1/7/00).]
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Fungal skin infections

- **Dermatomycoses**
  - *Tinea capitis* (ringworm), *tinea pedis* (athlete’s foot), *tinea cruris* (jock itch)
  - Agents are diverse fungi that can grow on hydrolysis of keratin
  - Controlled by topical antifungals, e.g., miconazole
- **Candidiasis**
  - Overgrowth of *Candida albicans*
  - May be superinfection resulting from antibiotic therapy
  - *Candidal vulvovaginitis* and *thrush*
  - Candidiasis can be systemic in immunocompromised hosts

Conjunctivitis

- Infection of the *conjuctiva*, mucous membrane lining the eyelid
- **Contagious conjunctivitis** - “pinkeye” - infection by *Haemophilus aegyptiae*
- **Viral conjunctivitis**, usually adenovirus
- **Neonatal gonorrheal ophthalmia**
- **Chlamydia trachoma** infections
  - *Inclusion conjunctivitis*
  - *Trachoma*, a major cause of blindness worldwide