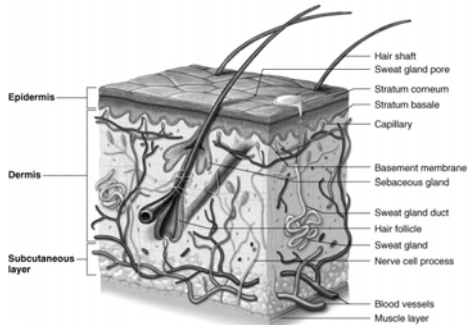


Infectious Diseases of the Skin and Eyes

Skin Structure

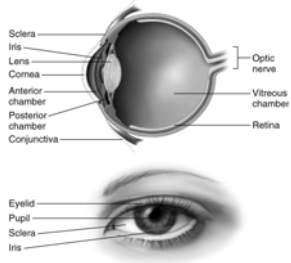


Natural Defenses of the Skin

- Keratin
- Skin sloughing
- Sebum: low pH, high lipid
- Sweat: low pH, high salt, and Lysozyme, which digests peptidoglycan

Normal Skin Flora

- *Propionibacterium acnes*
- *Corynebacterium sp.*
- *Staphylococci*
 - *Staphylococcus epidermidis*
 - *Staphylococcus aureus*
- *Streptococci sp.*
- *Candida albicans (yeast)*
- *Many others*



The Eye

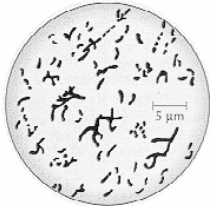
- Normal flora sparse
- Similar to skin flora
- Tears have lysozyme, IgA

Bacterial eye infection resulting from injury is a medical emergency!

Bacterial Skin Infections

- Acne
- Necrotizing fasciitis
- Leprosy

Acne



Microscopy

- *Propionibacterium acnes*: Gram + rod
- Digests sebum
- Attracts neutrophils
- Neutrophil digestive enzymes cause lesions, "pus pockets"

Acne

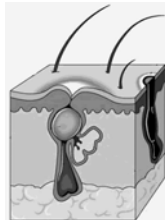
- Most common skin disease in humans
- Oil-based cosmetics worsen disease
- No effects of diet



Figure 10-10a (top) and 10-10b (bottom) are from: © 2014 Pearson Education, Inc. All rights reserved. © 2014 Pearson Education, Inc. All rights reserved.

Acne Treatments

- Benzoyl peroxide dries plugged follicles, kills microbes
- Tetracycline (antibiotic)
- Accutane – inhibits sebum formation



Necrotizing Fasciitis “Flesh Eating Strep”

Streptococcus pyogenes (Group A Strep)

- Tissue digesting enzymes
 - Hyaluronidase
 - Streptokinase
 - Streptolysins
- Rapidly spreading cellulitis may lead to loss of limb



Necrotizing Fasciitis

- Disease starts as localized infection
- Pain in area, flu-like symptoms
- Invasive and spreading
- May lead to toxic shock (drop in blood pressure)
- Incidence 1-20/100,000
- 30-70% mortality
- Surgical removal, antibiotics

Hansen’s Disease: Leprosy

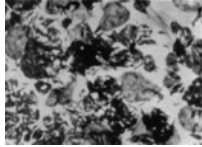
Mycobacterium leprae

- Disease of skin and nerves
- Change of pigmentation, loss of sensation
- Slow progressing
- Transmits poorly
- Droplet or skin contact?



Hansen's Disease: Leprosy

- *Mycobacterium leprae*
- Acid fast bacterium
- Slow growth
- Strict parasite
- Multiplies in macrophages
- Prefers cool areas of body
- Long course, drug cocktail



Virus Infections of the Skin: Rashes

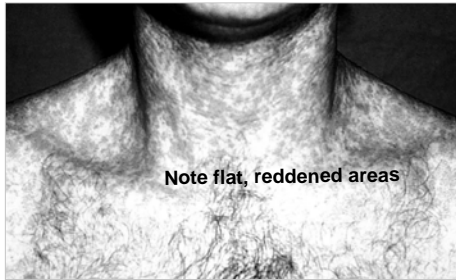
Maculo-papular rashes
(flat to slightly raised colored bump)

- Measles virus (Rubeola)
- Rubella virus (German Measles)
- Roseola (Human Herpesvirus-6)
- Fifth Disease (Human Parvovirus B19)

Measles

- Viral infection through aerosol droplet: One of the MOST communicable viruses
- Initial infection of the oro-pharynx
 - local infection lymph node(s) (of the neck)
 - lymphocyte associated viremia
 - Fever, malaise
 - Spread throughout the body
 - Shed in respiratory tract secretions
 - Koplik's spots
 - Skin Rash
 - Recovery; life long immunity
- Effective childhood vaccine (2-3 doses): MMR (measles, mumps, rubella), but disease still exists worldwide

An example of the rash of measles.

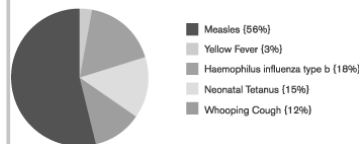


Measles World Wide

- Measles is the leading cause of vaccine-preventable death among children
- Millions of children still remain at risk from measles.
- In developed, measles death rates range from 1-5%, but among malnourished children, the death rate reaches 10-30%
- Over 500,000 children under the age of five die each year.
- Measles causes health complications, including pneumonia, diarrhea, encephalitis, and corneal scarring.
- The primary reason for ongoing high childhood deaths is the failure to deliver at least one dose of measles vaccine to all infants.

Measles World Wide

Causes of Vaccine-Preventable Child Deaths in Africa (AFRO 2000)



The Measles Vaccine Initiative 2001-
American Red Cross
United Nations Foundation (UN Foundation)
United States Centers for Disease Control and Prevention (CDC)
World Health Organization (WHO)
United Nations Children's Fund (UNICEF)

Rubella

- Viral infection through aerosol droplet; systemic infection
- A ~Mild~ rash
- Serious for a fetus when contracted in the first trimester of pregnancy
- Disrupts fetus development of the CNS and/or other organs: Congenital Rubella Syndrome
 - Small birth weight, blindness, hearing loss, mental retardation, heart problems
 - Infection lasts for months-years in the newborn
- Vaccine highly effective (MMR)

Features for Measles and Rubella

Disease	Measles	Rubella
Causative Organism(s)	Measles virus	Rubella virus
Most Common Modes of Transmission	Droplet contact	Droplet contact
Virulence Factors	Syncytium formation, ability to suppress CMI	In fetuses: inhibition of mitosis, induction of apoptosis, and damage to vascular endothelium
Culture/Diagnosis	ELISA for IgM, acute/convalescent IgG	Acute IgM, acute/convalescent IgG
Prevention	Live attenuated vaccine (MMR)	Live attenuated vaccine (MMR)
Treatment	No antivirals; vitamin A, antibiotics for secondary bacterial infections	-
Distinguishing Features of the Rashes	Starts on head, spreads to whole body, lasts over a week	Milder red rash, lasts approximately 3 days

Virus Infections of the Skin: Vesicles

Vesicular or pustular rash
(elevated lesions filled with fluid)

- Smallpox (Human Pox virus)
- Cold Sores (Human simplex 1 and 2)
- Chickenpox (Human Herpesvirus-3)

Chickenpox "Varicella – Zoster"

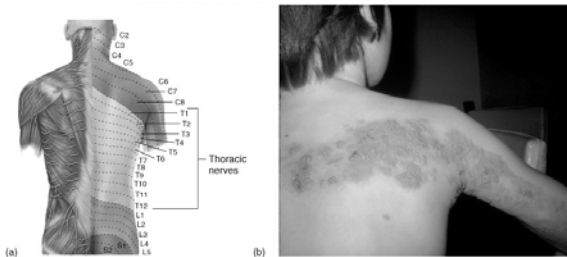
- Common virus; decreasing disease in the USA due to effective childhood vaccine
- Benign disease with life long immunity
- Life-threatening for immunocompromised individuals
- Recuperation can result in life long benign Varicella-zoster virus latency
- May re-emerge as shingles (skin lesion):
Should we vaccinate adults?

Chickenpox virus in the body

- Viral infection through aerosol droplet; systemic infection
 - local infection in lymph node(s) (of the neck)
 - lymphocyte associated viremia
 - Fever, malaise
 - Spread throughout the body
 - Shed in respiratory tract secretions and
 - Skin Vesicles (small blisters of clear fluid)
 - Recovery with virus latency in neurons
 - Life long immunity
- May re-emerge as shingles and spread to others (skin vesicular lesions):

Chicken pox reemerges as Shingles

Causes: stress, X-ray treatments, drug therapy, or a developing malignancy, or ?


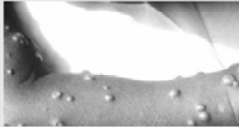


Varicella-zoster virus reemergence as shingles

Smallpox

- A disease with an interesting history
- Very infectious viral disease (epidemic)
- The disease has been eliminated due to world-wide vaccine program:
 - Vaccinia: a Jennerian vaccine
Named for Edward Jenner, 1796
- The virus has been preserved in government labs by agreement, at CDC in Atlanta, and in Russia
- Considered a bioterrorism agent

Features of Chickenpox and Smallpox.

Disease	Chickenpox	Smallpox
Causative Organism(s)	Human herpesvirus 3 (varicella-zoster virus)	Variola virus
Most Common Modes of Transmission	Droplet contact, inhalation of aerosolized lesion fluid	Droplet contact, indirect contact
Virulence Factors	Ability to fuse cells, ability to remain latent in ganglia	Ability to dampen, avoid immune response
Culture/Diagnosis	Based largely on clinical appearance	Based largely on clinical appearance
Prevention	Live attenuated vaccine	Live virus vaccine (vaccinia virus)
Treatment	None in uncomplicated cases, acyclovir for high risk	-
Distinguishing Features	No fever prodrome; lesions are superficial; in centripetal distribution (more in center of body)	Fever precedes rash; lesions are deep and in centrifugal distribution (more on extremities)
Appearance of Lesion		

Virus Infections of the Eye

Herpesvirus Keratitis (Human simplex 1)



Chlamydial infection of the eye

Chlamydia trachomatis causes trachoma and can lead to blindness

Warts and Papillomas

- Mostly a benign viral infection
- Nearly everyone is infected!
- Contact transmission; fomite transmission
- Different virus types
 - Plantar warts (HPV-1)
 - Flat warts (HPV-3,10,28,49)
 - Genital Warts (HPV 6,16,18,31)

Common warts

