SKIN INFECTIONS

ADVANCE ORGANIZER
Skin is our boundary between our body and the rest of the world. Properties of the skin cause it to resist microbial colonization, provide a physical barrier to the entry of potential pathogens. We will concentrate on a few of the things that can invade and colonize the body when the barrier is broken. Sometimes the skin is attacked by organisms entering through the respiratory or digestive systems.

ANATOMY AND PHYSIOLOGY
In addition to assisting in the body’s regulation of temperature and in fluid balance, skin repels potential pathogens by being tough, dry, acidic and toxic.

NORMAL BIOTA
Diphtheroids are gram-positive, rod shaped bacteria that come in many sizes. This group includes Propionibacterium acnes whose growth is enhanced by oily secretions from the sebaceous glands. P. acnes produces fatty acids from the oils. They are usually strict anaerobes but some tolerate air.

Staphylococci are gram-positive cocci that help prevent colonization by potential pathogens and maintain the balance among flora of the skin. Staphylococcus epidermidis is universally present on the skin and can be pathogenic at times. Single celled yeasts of the Malassezia species are found on the skin and may at times cause dandruff as well as pityriasis vericolor and in AIDS patients serious rashes.

SKIN DISEASES CAUSED BY BACTERIA

Staphylococcus aureus is the cause of furuncles and carbuncles. It is coagulase positive and can be a problem because it is often resistant to penicillin and other antibiotics. In furunculosis (boils) the S. aureus invades the skin via hair follicles. The bacteria generally originate from the nose. Protein A plays a role in pathogenesis. Carbuncles are dangerous because the infection can spread easily to brain or bone or the heart.

Certain strains of Staphylococcus aureus also cause of scalded skin syndrome because they make an exotoxin that causes exfoliation. It got its name because it resembles a severe burn. Most cases are in newborn infants.
Impetigo, a superficial skin infection can be caused by Staphylococcus aureus and by Streptococcus pyogenes. Pathogenesis is aided by the capsule (group A carbohydrate) and the M-protein of the cell wall of S. pyogenes (an air tolerant Gram-positive cocci occurring in chains) which interferes with phagocytosis. Fortunately, penicillin or erythromycin is effective in most S. pyogenes infections. A complication of this and other streptococcal skin infections can be acute glomerulonephritis of the kidneys.

Rocky Mounted Spotted Fever is transmitted to humans through the bite of an infected Dermacentor tick. It is caused by Rickettsia rickettsiae, a small Gram-negative rod that must live intracellularly. Blood vessel damage causes hemorrhages throughout the body. Tetracycline and chloramphenicol are used in the early treatment of Rocky Mountain spotted fever but diagnosis is difficult.

Lyme disease is caused by transmission to humans by Ixodes ticks. It is caused by a spirochete, Borrelia burgdorferi. The bullet shaped rash left by the bite is called an erythema chronicum migrans. In addition the heart, joints, nervous system and other tissues can be involved. Amoxicillin, erythromycin and doxycycline are useful in treating this disease if diagnosed early.

Ehrlichiosis has been referred to as "Rocky Mountain spotless fever". Ehrlichia chaffeensis causes a human monocyte ehrlichiosis. The ticks which transmit this are Amblyomma americanum [the lone star tick] and Dermacentor variabilis [the American dog tick]. This is an emerging disease. Most doctors have the tools to diagnose it. Can you figure out what E. chaffeae, the small gram-negative, obligately intracellular bacteria is named after?

SKIN DISEASES CAUSED BY VIRUSES

Both chicken pox and measles enter the body through the respiratory system and are spread by respiratory droplets. Chicken pox (also known as Varicella) is caused by a member of the herpesvirus family, varicella zoster. Months or even years after chicken pox, reactivation of a varicella virus is possible. The distribution of the virus in the sensory nerves--is apparent from the symptoms. Such reactivations can cause new chicken pox epidemics or may occur in adults as herpes zoster (shingles).
Rubeola (measles) can be serious--that is fatal in some cases since it can cause pneumonia and encephalitis and in other cases can lead to serious secondary bacterial infections. This disease is now being controlled by immunizing young children with a two dose regimen. Susceptible adults are also immunized. The Rubeola virus is a member of the Paramyxovirus family. The vaccination is with a live attenuated virus.

Rubella (also called three day measles or German measles) if contracted by a woman in the first 8 weeks of pregnancy results in congenital rubella syndrome. Otherwise the symptoms are generally mild. The Rubella virus is a member of the Togavirus family. Again a live virus vaccine is now available.

Other Rash causing viruses
Erythema infectiosum [or Fifth disease] is caused by parvovirus B 19. It resembles a "slapped" check, this symptom comes and goes.
Exanthem subitum [or roseola infantum] is the result of herpesvirus, type 6. The disease occurs in infants. The symptoms are several days of a high fever followed by a transitory rash [which appears as the temperature returns to normal].

Warts are skin tumors caused by a number of papillomaviruses. Some genital warts are associated with cancer of the cervix. Most others are benign. All can have a long incubation period but removal of the wart itself may not eliminate the infection.

DISEASES CAUSED BY FUNGI

Dermatophytosis, Athlete’s foot and ringworm are caused by mold-type fungi [of the genera Trichophyton, Microsporum, Epidermophyton and others] which feed on keratin containing cells. These outer layers of the skin, hair and nails are particularly susceptible if moist.
Invasive skin infections are sometimes caused by a yeast--Candida albicans.