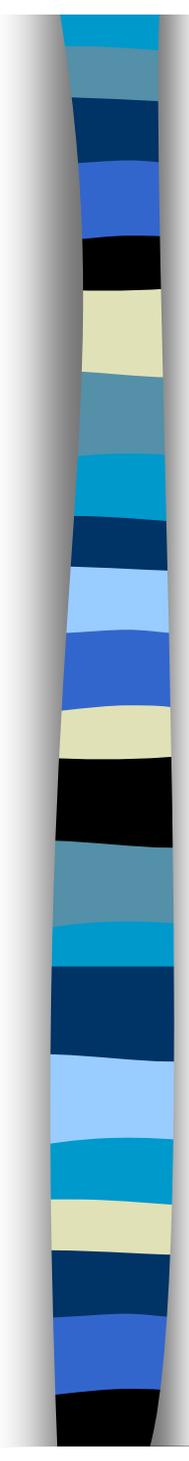


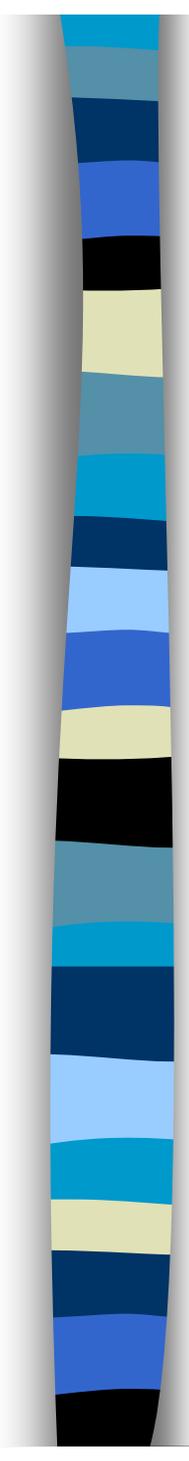
MICROBIOLOGY

Rita Carey-Nita R.N., B.S.N.



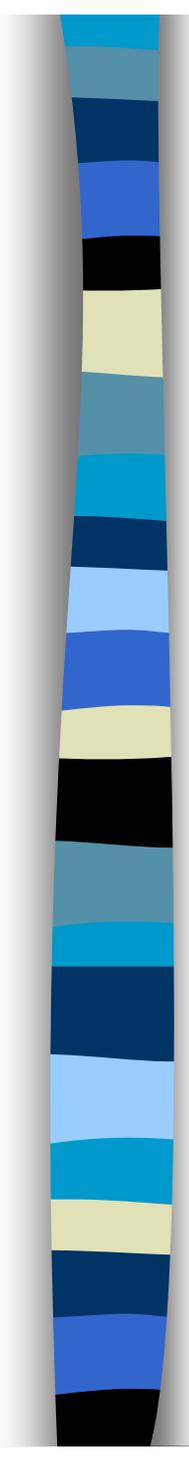
Microbiology

- Disease is a failure of the body to function normally.
- Many types of disease not all caused by germs.
 - Birth defects
 - Age related degenerative diseases
 - Tumors
 - Disease related to trauma, nutritional deficiencies, and environmental toxins



Microbiology

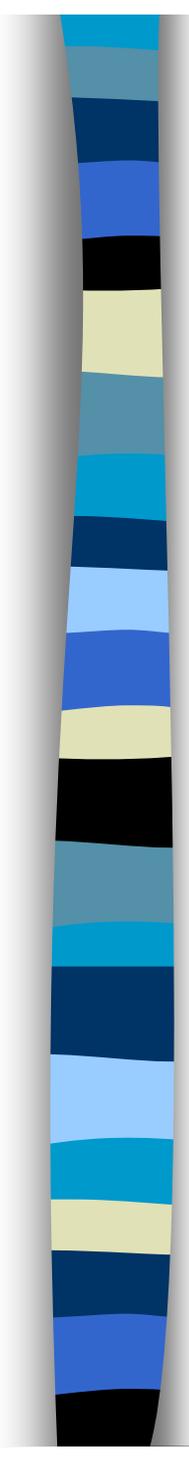
- When a pathogen (disease producing organism) invades the body normal structure and function is disrupted resulting in disease.
- Infection is the development of symptoms as a result of invasion of pathogens.



Microbiology

Types of infection

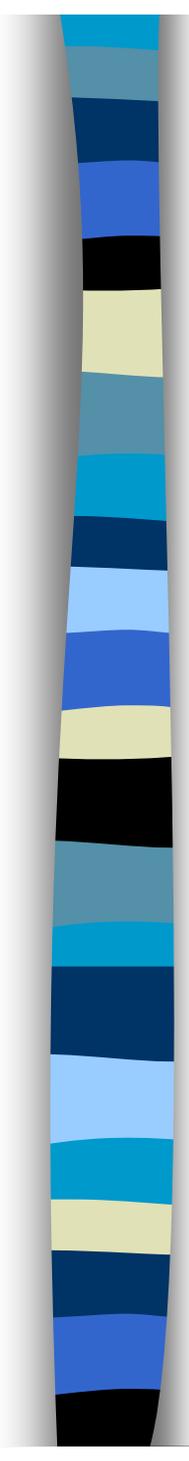
- Localized infection: restricted to a small area
- Systemic infection: more widespread
- Bacteremia/Septicemia: bacteria in blood spreading throughout the body
- Acute: begins abruptly and severe
- Chronic: slow progression and last longer
- Nosocomial: acquired in health care facility



Microbiology

■ Key Terms:

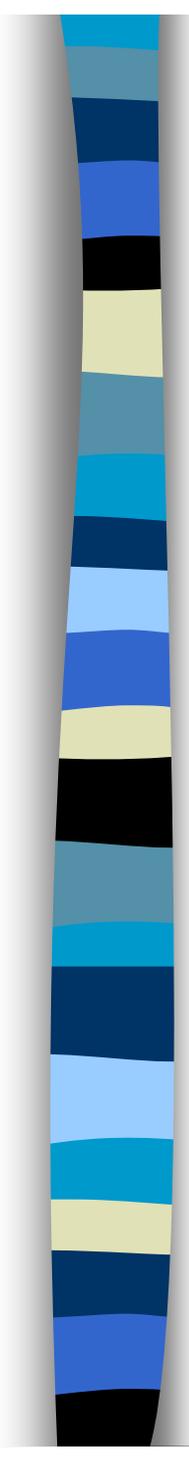
- Epidemiology: study of the occurrence & distribution of disease in a population
- Incubation period: time from exposure till symptoms manifest
- Communicable disease: disease that can be spread from host to host
- Contagious disease: disease that is easily spread



Microbiology

■ Key Terms:

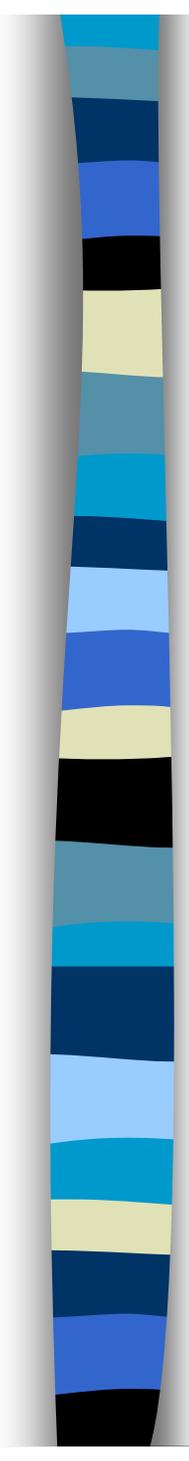
- Epidemic: disease acquired by many people in a given area.
- Endemic: disease that is always present in a population.
- Pandemic: worldwide epidemic.
- Antibiotics: chemicals used to treat bacterial infections. (broad/narrow spectrum)



Microbiology

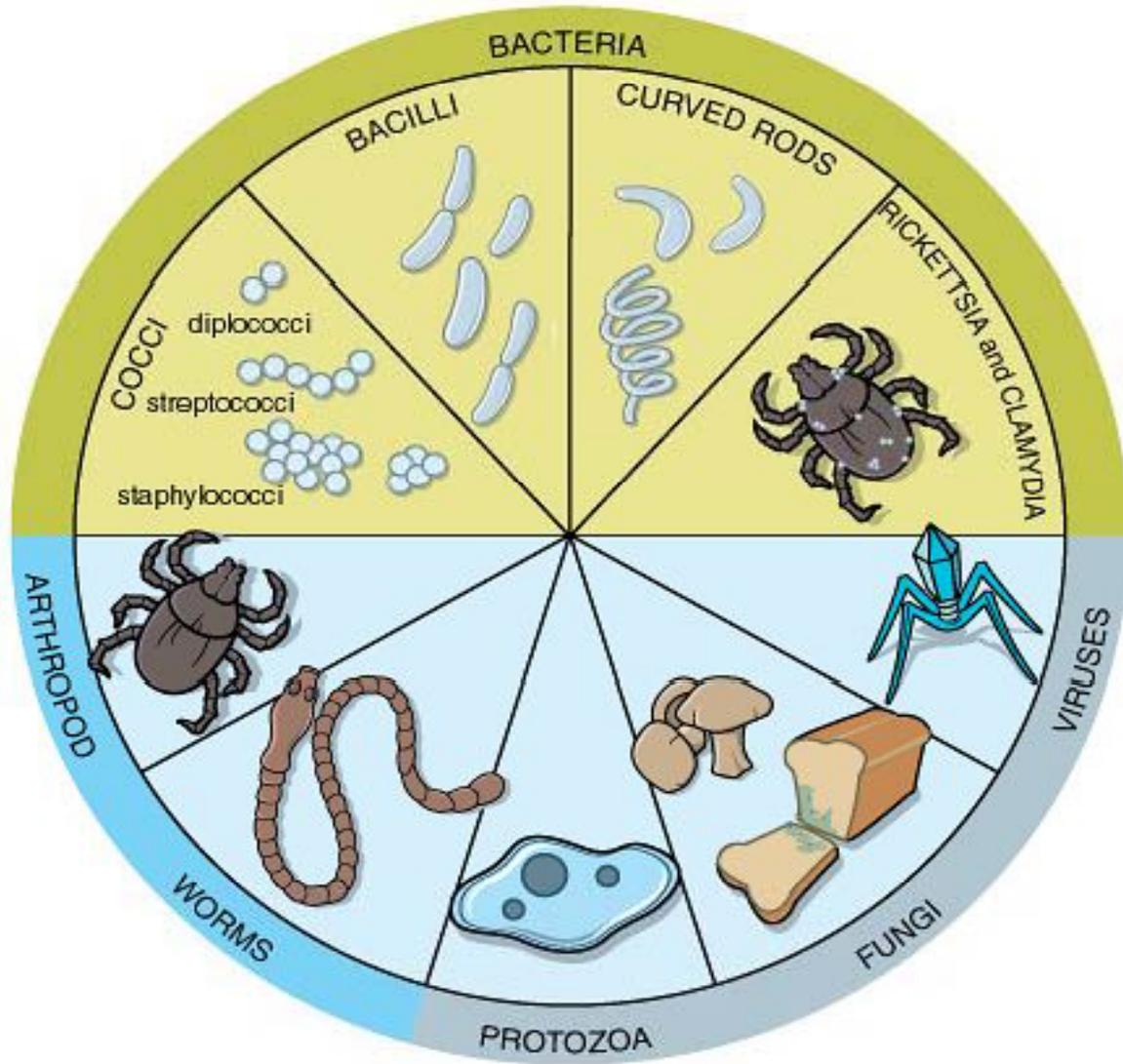
■ Key Terms:

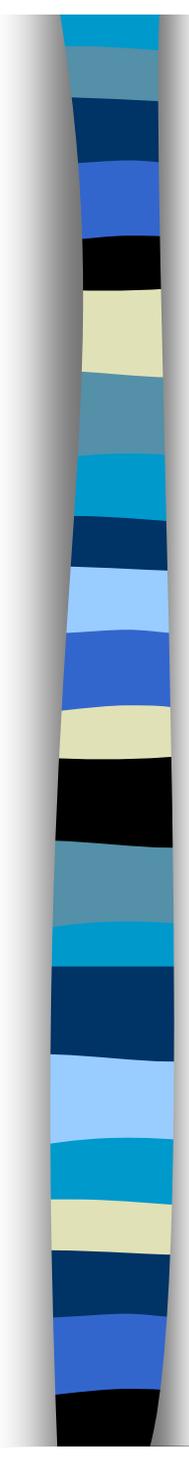
- Normal flora: are microorganisms on/in body that do not cause disease
- Resistance: ability to ward off disease
- Susceptibility: inability to ward off disease
- Sterilization: process that kills microorganisms
- Vector: Carrier of pathogen from host to host. ie living deer tick-lyme disease



Microbiology

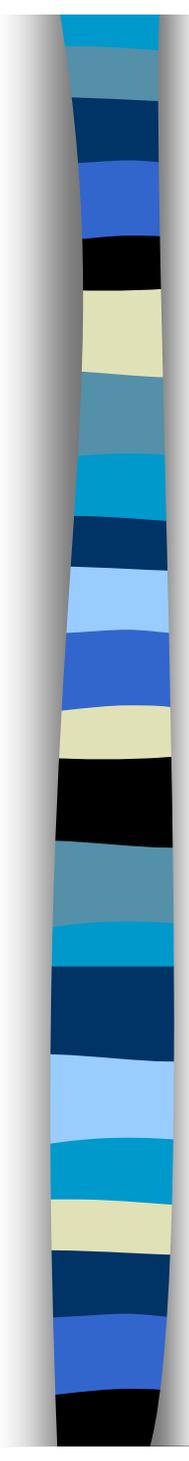
- Types of Microorganisms:
 - Some are pathogens and some are not.
 - Microorganisms include:
 - bacteria
 - viruses
 - fungi
 - protozoa
 - anthropods
 - worms





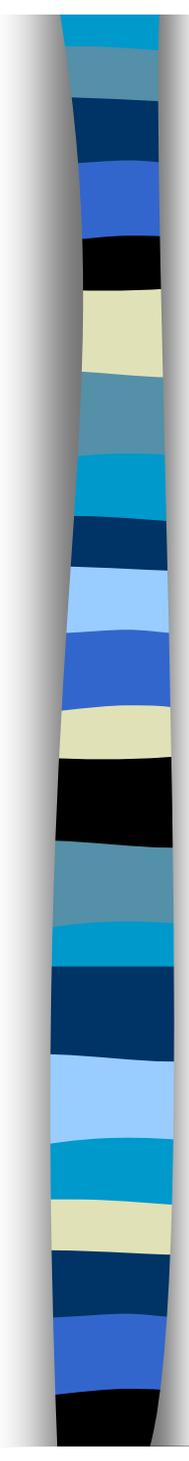
MicroBiology

- Bacteria: single cell organism found everywhere:
 - Can be normal flora; lives in & on the human body; prevents the overgrowth of other organisms, keeping control
 - Can synthesize vitamins, ie vitamin K
 - Can cause disease-enters & grows in human cells/ secrete a toxin that damages cells



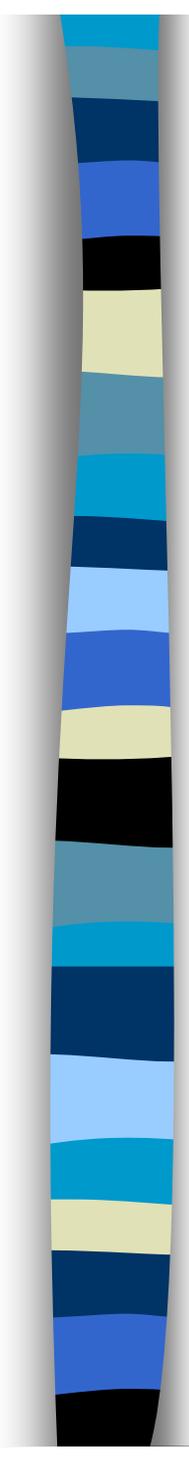
Microbiology

- Classified into three groups based on shape:
 - Coccus: round
 - Bacillus: rod
 - Curved rods
- Rickettsiae and Chlamydiae are also classified as bacteria but differ from cocci, bacilli, curved rods



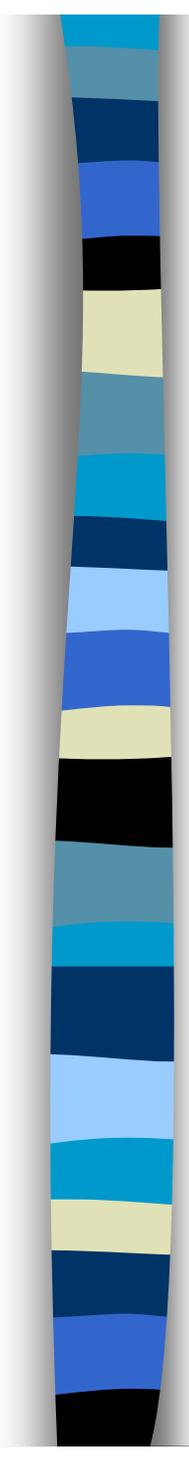
Microbiology

- Cocci are arranged in patterns:
 - Diplococcus: pairs
 - Streptococcus: chains
 - Staphylococcus: clusters
- Disease associated with cocci include:
 - Gonorrhoea
 - Meningitis
 - pneumonia



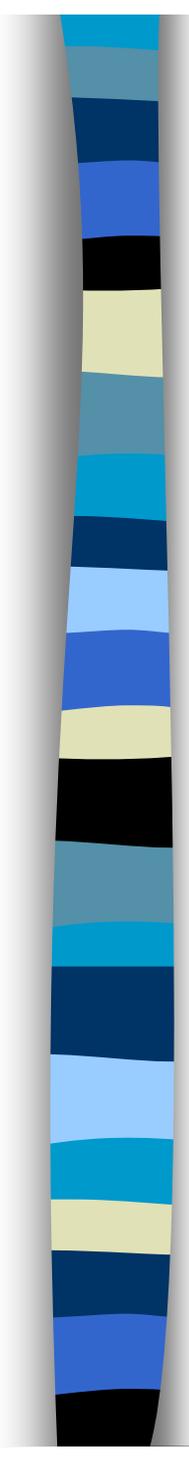
Microbiology

- Bacilli are long and slender and shaped like a cigar
- Diseases caused by bacilli include:
 - Tetanus
 - Tuberculosis
 - Diphtheria



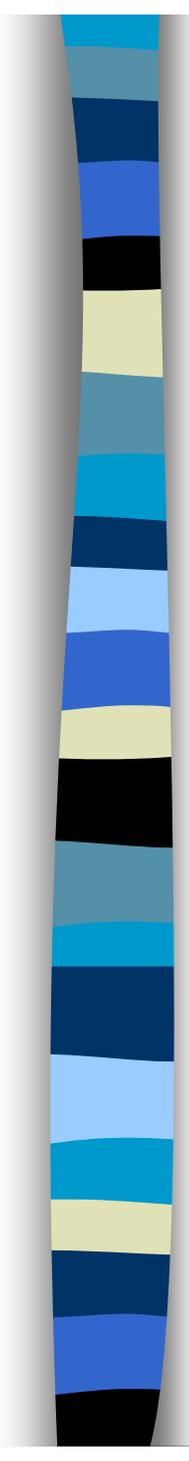
Microbiology

- Curved Rods include:
 - Vibrio: comma shaped
 - Spirillum: corkscrew
 - Spirochete: highly coiled
- Disease produced:
 - Vibrio: cholera
 - Spirochete: Treponema pallidum, causes Syphilis



Microbiology

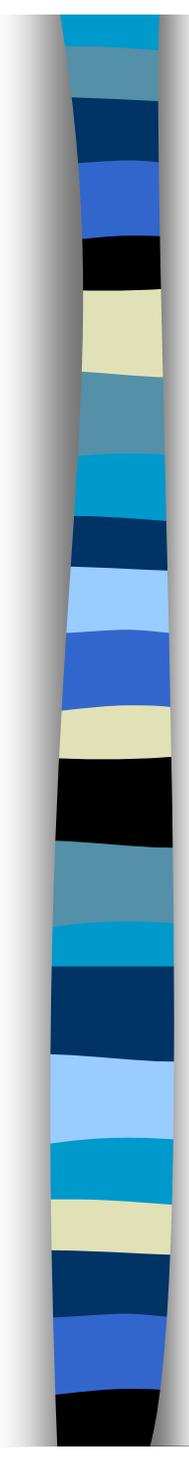
- Important characteristics of Bacteria:
 - Aerobic bacteria: reproduce in the presence of oxygen
 - Anaerobic bacteria: reproduce in the absence of oxygen
 - They have cell walls to protect them
 - Form spores that lie dormant & are difficult to eliminate, i.e. Botulism
 - Can produce harmful chemical (toxins)



Microbiology

■ Parasitic Bacteria

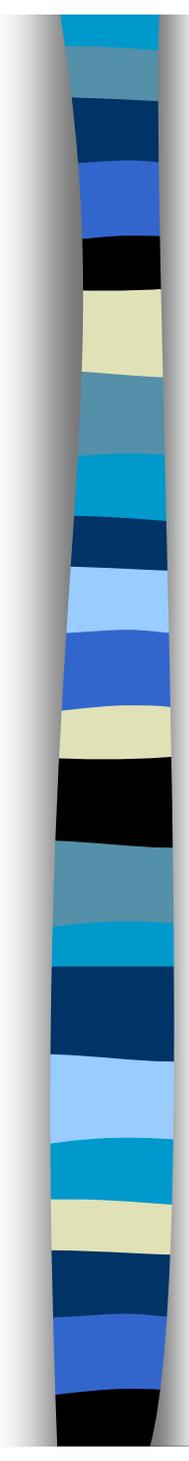
- Smaller than most bacteria & need to reproduce in a living host (parasites)
 - Chlamydia: Chlamydia Trachomatis is the most common STD
 - Rickettsia: Rocky Mountain spotted fever carried by a tick
the rickettsiae can be carried by flies, ticks & body lice



Microbiology

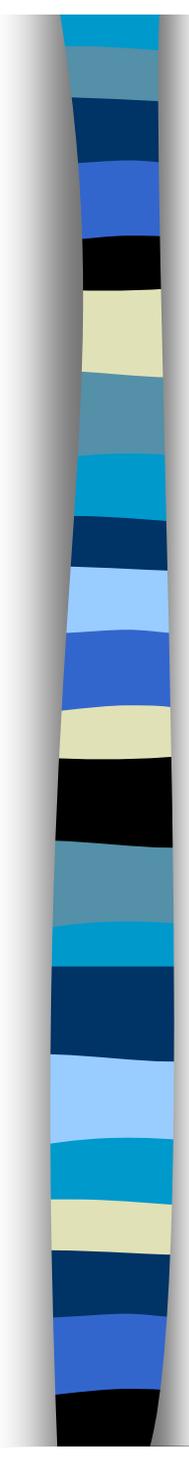
■ Viruses

- Smallest infectious agent & are not cells
- DNA or RNA surrounded by protein shell
- Reproduce only in living cells of host so considered parasites
- Difficult to treat due to closeness of virus and host cell
- Do not respond to antibiotics



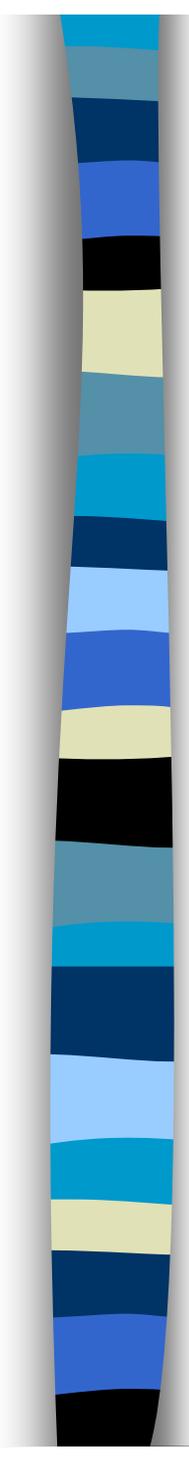
Microbiology

- Disease produced by viruses:
 - Mumps
 - Measles
 - Polio
 - Influenza
 - AIDS



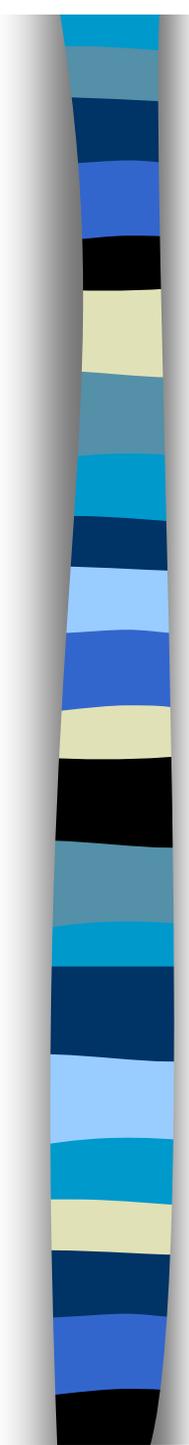
Microbiology

- Fungus is a plantlike organism that grows best in dark, damp places
- Types: Yeast & Mold
- Pathogenic fungi cause mycotic infections: i.e. Athlete's foot, ring worm, thrush, vaginitis (overgrowth of candida albicans)
- Systemic infection is rare but difficult to treat



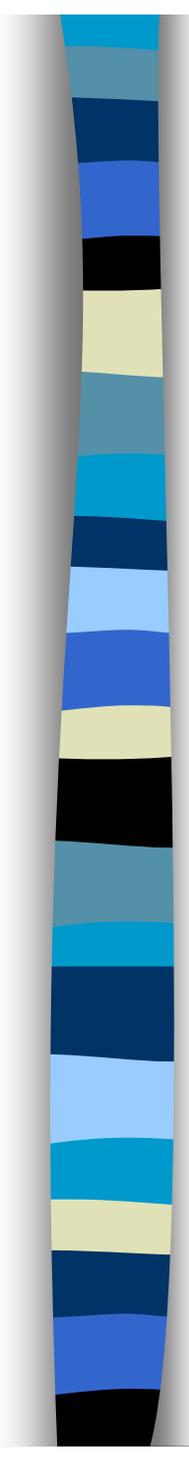
Microbiology

- Protozoa: single cell, animal like microbes.
- Four main types:
 - Amebas
 - Ciliates
 - Flagellates
 - Sporozoa



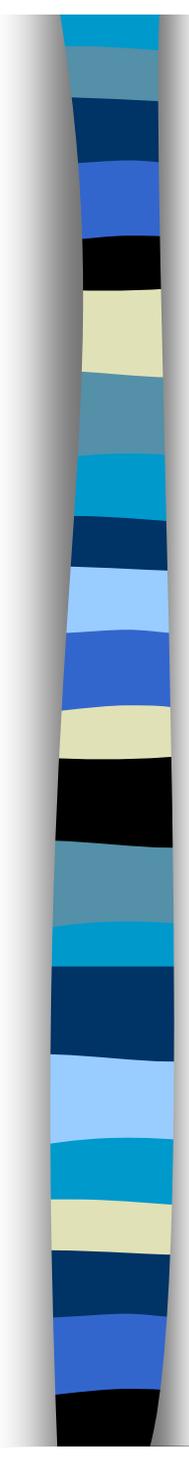
Microbiology

- Protozoa are found in water & soil
- Diseases include:
 - Amebic dysentery & Giardiasis: parasites ingested in contaminated food & water
 - Malaria: sporozoan called plasmodium malariae carried by mosquito
 - Pneumocystis carinii causes pneumonia
 - Cryptosporidium causes diarrhea



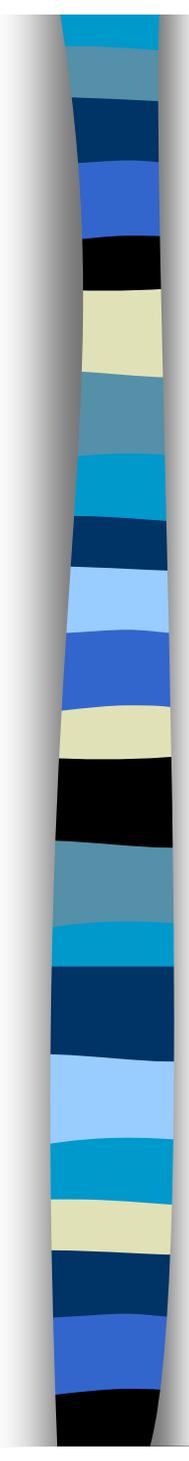
Microbiology

- Multicellular Organisms:
 - Parasitic worms
 - Arthropods
- Parasitic Worms called helminths
 - Parasitic & Pathogenic to humans
 - Require stool specimen to diagnose most worm infestations



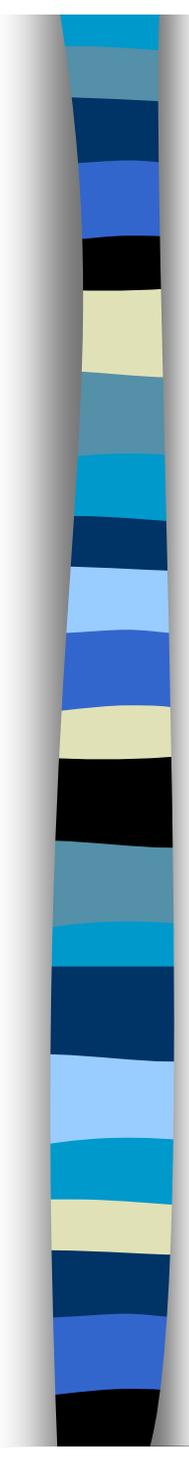
Microbiology

- Two types of worms:
 - Roundworms & Flatworms
- Roundworms include:
 - Ascarides
 - Pinworms
 - Hookworms
 - Trichinea
 - Filariasis



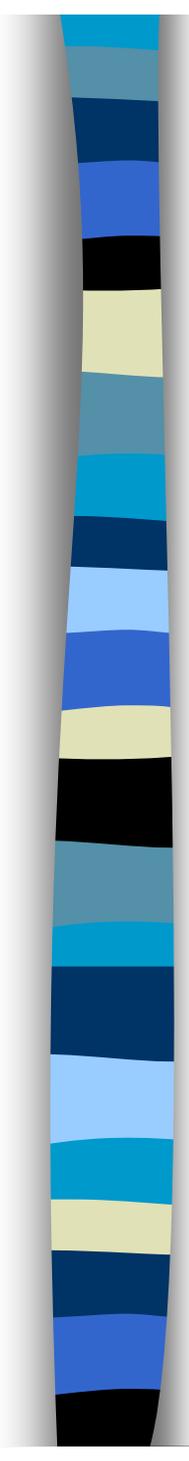
Microbiology

- Pinworms are the most common and transferred by fecal oral route
- Trichinosis is transmitted by ingestion of uncooked pork
- Filariasis is transmitted by biting insect



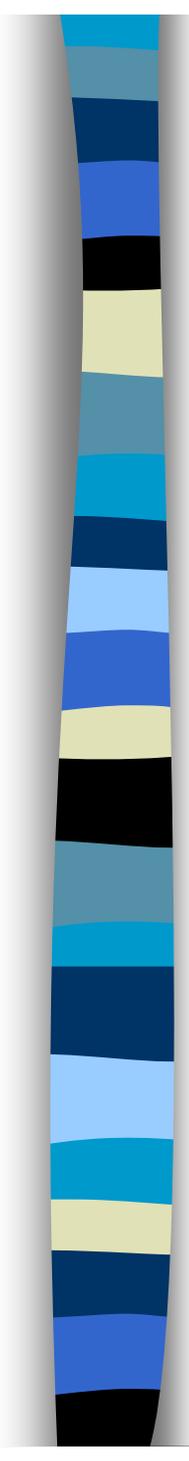
Microbiology

- Flatworms include:
 - Tapeworms and Flukes
- Tapeworms live in intestine & may grow 5 – 50 feet long
- Flukes are flat, leaf-shaped that invade blood, liver, lungs & intestines.
- Feed off host causing weight loss & anemia
- Treat with anti-helminths



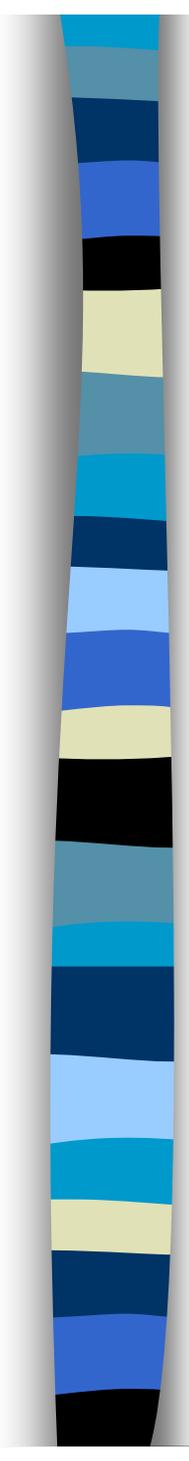
Microbiology

- Arthropods are animals with jointed legs. Include ticks and insects.
- Ectoparasites: live on the surface of the body, skin & mucous membranes.
- Not life threatening but cause itch & discomfort



Microbiology

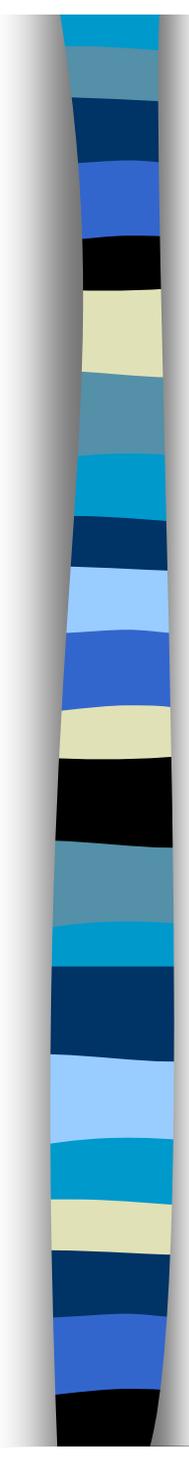
- Arthropods that are more serious include: mosquitoes, biting flies, fleas, & ticks because they act as vectors of disease.
- A bite from an arthropod introduces a pathogen into the host causing infection
 - Mosquito: malaria
 - Tick:
 - Lyme disease
 - Rocky Mountain spotted fever



Microbiology

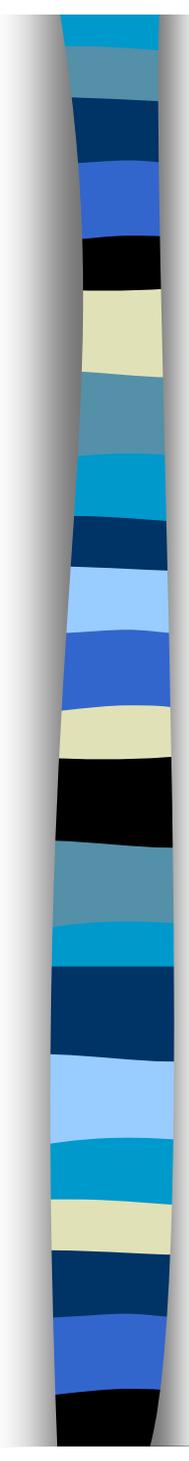
Identification of Pathogens

- Bacteria are classified by **Gram Staining**
 - A gram-positive bacterium is purple or blue
 - Streptococcus is gram-positive
 - A gram-negative bacterium is pink or red, does not pick up the purple stain
 - Escherichia coli is gram negative
 - Gram staining is the first step in identification of the organism



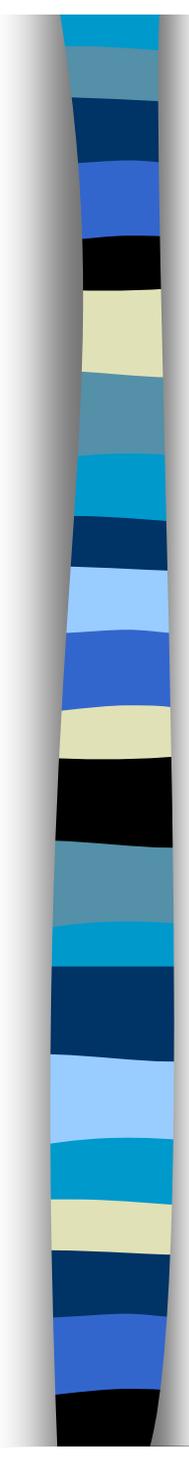
Microbiology

- **Acid Fast** is another staining
- The bacterium is first stained with a red dye then washed with an acid.
- Most bacteria loss the red stain.
- Those that retain the red stain are referred to as acid-fast.
- Most common acid fast bacteria is *Mycobacterium tuberculosis*



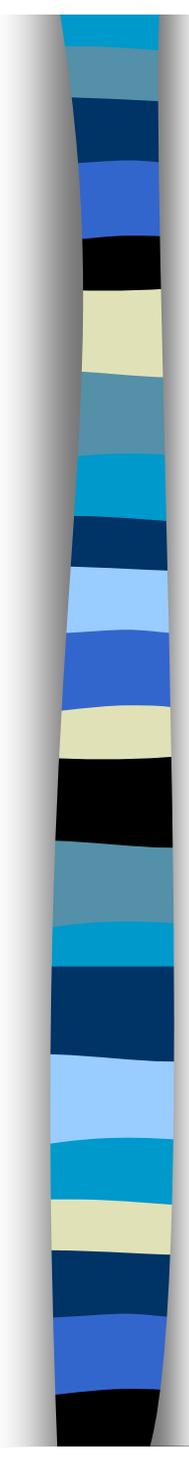
Microbiology

- To identify a pathogen growing in a wound a wound **culture** is ordered.
- A sample of the wound is taken and placed on culture medium that supports the growth of the pathogen.
- It is then stained and identified.
- **Culture- identifies the organism**



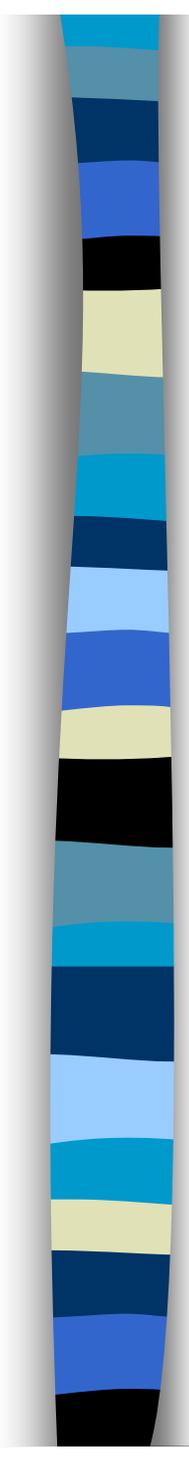
Microbiology

- A **culture & sensitivity** may be ordered as well to determine pathogens susceptibility to antibiotics.
- If the antibiotic placed on the culture stops the growth of the pathogen it is said to be sensitive to the effects of the antibiotic.
- That is the antibiotic the physician can give to the patient to treat the infection
- **Sensitivity- determines the drug of choice**



Microbiology

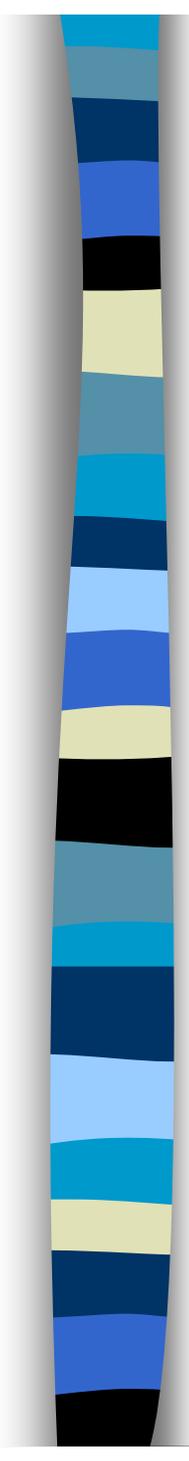
- Spread of Infection
- Pathogens enter the body by **portals of entry**: respiratory tract, GI tract, GU tracts, skin, eyes, mucous membrane, bites, cuts and surgery
- Entry is how the pathogen enters the body
- Respiratory & GI tract most common entry
- Break in skin is another excellent source



Microbiology

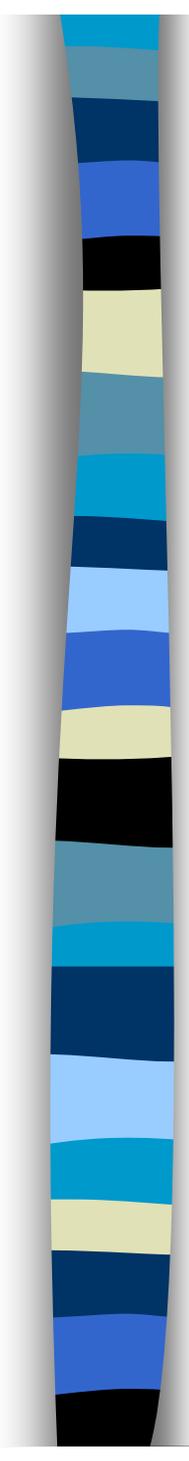
- **Portal of Exit** is how a pathogen leaves an infected body.
- Include: Respiratory tract, GI tract, GU tract, blood, bodily fluids, skin, eyes (tears), breasts (milk)
- Most common portal of exit is respiratory and GI tract

Example: Common cold virus spreads with sneezing or cough



Microbiology

- Knowing the portal of exit of a pathogen can assist in preventing the spread of the pathogen.
- Example: *Salmonella typhi* is excreted in stool so caution is taken when handling underwear or bed linens.



Microbiology

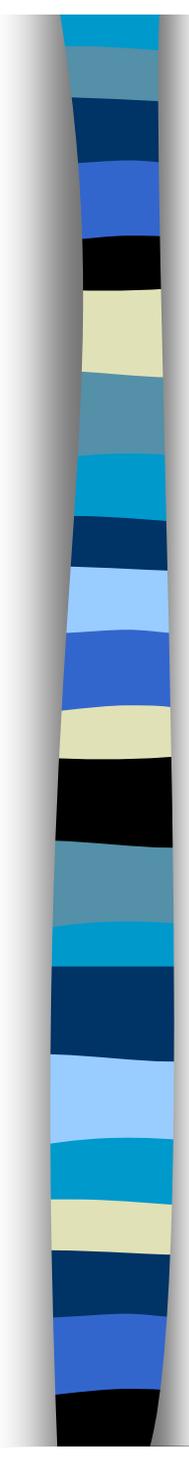
■ How pathogens spread:

– Person to person-

- Droplet: sneeze then inhaled
- Vector: from hand to hand, hand to phone then phone to hand
- Fomite: non-living; hankies, doorknobs, syringe

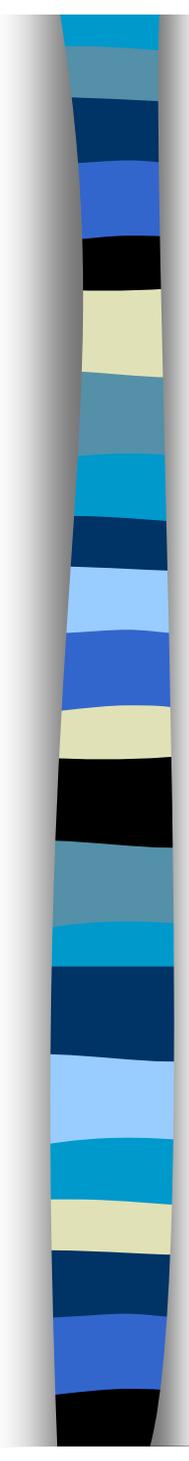
– Environmental to person- water, air, soil, food

- Eat contaminated food
- Drink contaminated water
- Walking in contaminated soil



Microbiology

- Tiny animal to person
 - Insects
 - Mosquito bites a person with malaria
 - Then malaria causing plasmodium matures in the mosquito's stomach
 - The mosquito then bites another person and spreads the malaria
 - This is example of a **Biological Vector**
 - Need the mosquito to mature the plasmodium
 - **Mechanical Vector** simply spreads the pathogen



Microbiology

■ Germ Stories

- Wash those Mittens
 - Nosocomial
- Flora and her Vaginal Itch
 - Opportunistic infection
- Rick, Nick, and the Sick Tick
 - Tick as reservoir of infection, spread by bite
 - Communicable disease
- Typhoid Mary
 - *Salmonella typhi* spread from contaminated hands

Spread of infection

