MICROBIOLOGY

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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

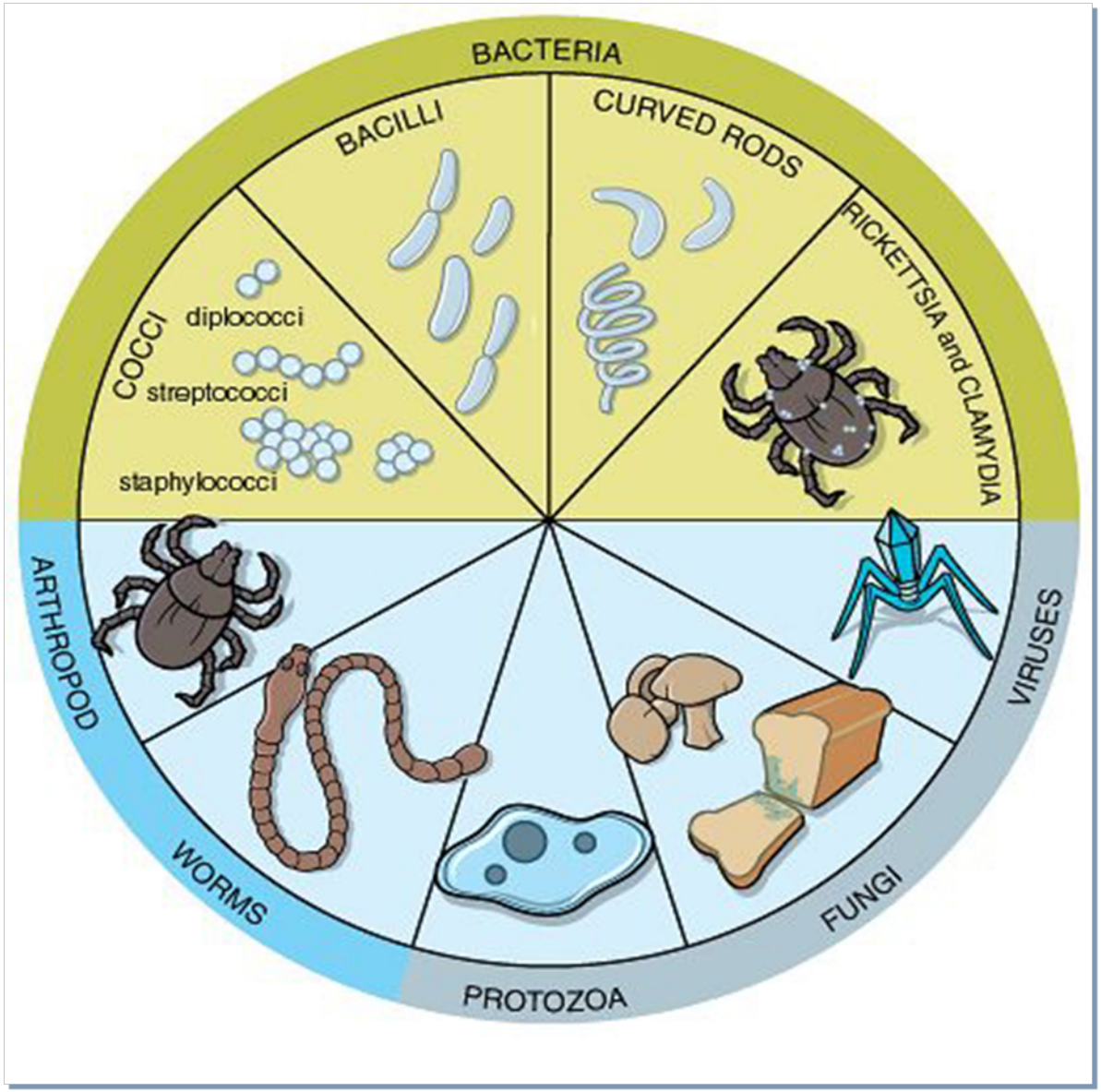
- Key Terms:
  - Epidemic: disease acquired by many people in a given area.
  - Endemic: disease that is always present in a population.
  - Pandemic: worldwide epidemic.
  - Antibiotics: chemicals used to treat bacterial infections. (broad/narrow spectrum)

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.
  - Microoganisms include:
    - bacteria
    - viruses
    - fungi
    - protozoa
    - anthropods
    - worms


BACTERIA
BACILLI
CURVED RODS
RICKETTSIA and CLAMYDIA
COCCI
diplococci
streptococci
staphylococci
ARTHROPOD
WORMS
PROTOZOA
FUNGI
VIRUSES

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
  - Staphlycoccus: clusters
- Disease associated with cocci include:
  - Gonorrhea
  - Meningitis
  - pneumonia

Microbiology

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

Microbiology

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

Microbiology

- Important characteristics of Bacteria:
  - Aeorbic bacteria: reproduce in the presence of oxygen
  - Anerobic 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
  - Sporazoa

Microbiology

- Protozoa are found in water & soil
- Diseases include:
  - Amebic dysentery & Giardiasis: parasites ingested in contaminated food & water
  - Malaria: sporozoan called plasmoduim malariae carried by mosquito
  - Pneumocystis carinii causes pnuemonia
  - 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 tics 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 Mycobactrium 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 plasmoduim
  - **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 reservior of infection, spread by bite
    - Communicable disease
  - Typhoid Mary
    - Salmonella typhi spread from contaminated hands

Spread of infection