2017 MICROBES AND DISEASE

Normal flora – Many microbes have a positive symbiotic relationship with other organisms.

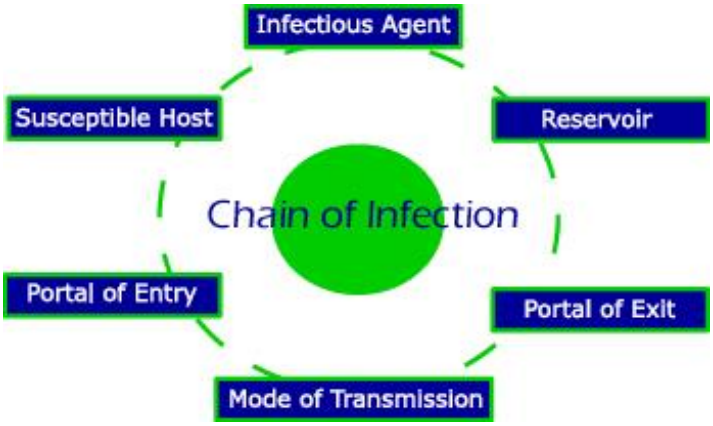
Mutualism – both organisms benefit.

Commensalism – one organisms and the other is not harmed or helped.

Parasitism is the condition (one organism is helped and the other is harmed) which takes place when humans are invaded by infectious microbes. A parasite-host relationship is created. The parasite is often called the **infectious agent**.

MECHANISM OF DISEASE

CHAIN OF INFECTION



The diagram above is a model used to understand the infection process. Each link in the chain must be present and in the correct sequential order for an infection to occur.

1. **Agent -** a microbial organism with the ability to cause disease
2. **Reservoir -** a place where agents can thrive and reproduce
3. **Portal of exit -** a place of exit providing a way for an agent to leave the reservoir
4. **Mode of transmission -** method of transfer by which the organism moves or is carried from one place to another
5. **Portal of Entry -** an opening allowing the microorganism to enter the host
6. **Susceptible host –** a person who cannot resist an microorganism invading the body, multiplying and resulting in infection

CHARACTERISTICS OF THE ELEMENTS

- Microbes which can be infectious agents include **bacteria, viruses, fungi, protozoa, algae, parasitic worms, and other pathogenic agents as prions.**

- Persons more vulnerable to becoming susceptible hosts include the young, the elderly, and people with weakened immune systems.

- Environments which bring the agent and host together **might involve such things as contaminated food that is ingested, an environment that allow a vector to introduce the agent into the host as a mosquito bite, air that allow an agent to be inhaled by a host or agents spread by contact between two people.**

- Sometimes there are organisms as insects, arthropods, or even mammals as dogs or bats who can act as **vectors** (organisms who allow the infecting agent to thrive, reproduce, and then act as the mode of transmission)

CONDITIONS WITHIN THE HOST

- **Contamination** – when a potentially infectious agent exists in the host but has not yet in invaded the tissues of the host. The microbe may be destroyed by the body defenses or it may become part of the normal flora.
- **Infection** – when the infectious agent begins its invasion of the host tissue and its rapid multiplication. The infection may be **localized** or it may spread to alternative sites as deeper organs or tissues becoming **systemic**
- **Disease –** when the cumulative effects of the infection cause damage in the tissues

CONTROLLING INFECTION AND DISEASE

- Eliminating the agent by using antibiotic or other medications
- Strengthening the immune system of the host by immunizations
- Eliminating the possible vectors – as reducing the mosquito populations
- Preventing contamination as by the proper cooking handling, cooking, and storage of food
- Isolating infectious individuals
- Using healthy habits as hand washing, proper sleep, diet, and exercise

MICROBIAL DISEASES

Below are samples of diseases caused by various groups of microbes. Be sure to check the National website at www.soinc.org to obtain the final **Official 2012 Disease List.**

VIRAL DISEASES - the first step in treating viral infection is preventing its occurrence and spread. Vaccines are available to prevent some common viral infections, such as chickenpox, polio, shingles, influenza, measles and mumps. Treatment of viral infections generally includes rest, increased fluids, good nutrition. Antiviral drugs help to minimize the severity of a viral infection.

- **AIDS** – disease of the human immune system caused by the HIV virus
- **Chicken Pox & Shingles** – diseases caused by the varicella zoster virus (VZV)
- **Common Cold** –infection of the upper respiratory tract – nose and throat
- **Dengue Fever** –infection from bite of an infected mosquito – usually in the tropics
- **Ebola Hemorrhagic Fever** –illness from Ebolavirus with severe bleeding
- **Hepatitis** – infectious liver disease – three viruses most common - hepatitis a, b, and c
- **Influenza** – commonly called the flu, highly infectious respiratory infection
- **Measles** – contagious infectious disease with a itchy skin rash
- **Mumps** – Infection of the parotid glands located below and in front of the ear
- **Mononucleosis** – "kissing disease" caused by Epstein-Barr virus
- **Polio** – highly infectious disease that invades the nervous system and can cause paralysis
- **Rabies –** potentially deadly infection of the brain spread by infected animals
- **Rubella -** Infection of skin by rubella virus – commonly called German measles
- **Small pox –** disease causes extensive (raised bumps) rash, fever – can be deadly
- **West Nile Fever –** virus spread by mosquitoes-causes fever, headache, swollen lymph nodes and body aches
- **Yellow Fever –** virus spread by mosquitoes – esp. in tropics – causing influenza-like symptoms to severe hepatitis to hemorrhagic fever

BACTERIAL DISEASES – The first step in treating bacterial diseases is preventing its occurrence and spread. Prevention of the spread of harmful bacteria that cause bacterial diseases also includes frequent hand washing and covering the mouth and nose with a tissue during sneezing or coughing. It is also important to avoid contact with a person who has the disease. Vaccines are available to prevent some bacterial diseases, such as meningitis, pneumonia, and tetanus. Antibiotics work by killing the bacterial or preventing their reproduction.

- **Anthrax –** acute infectious disease caused by spore forming bacteria – spores used as a bioterrorist weapon
- **Botulism** – serious food poisoning caused by a neurotoxin from a bacteria
- **Chlamydiasis** – sexually transmitted bacterial disease by bacterium ***Chlamydia***

- **Cholera** - an acute intestinal infection caused by ingestion of food or water contaminated with the bacterium Vibrio **cholera** causing profuse watery diarrhea and vomiting
- **Dental Caries (tooth decay) –** damages hard tooth structures
- **Legionnaire's Disease –** acute respiratory disease caused by Legionella bacteria
- **Lyme Disease** – inflammatory diseases – bacteria spread through tick bite
- **MRSA** - Methicillin-resistant Staphylococcus aureus infection - several difficult to treat infections in humans infecting the skin and other parts of the body
- **Peptic Ulcer Disease** – ulceration of the stomach by *H pylori* bacteria
- **Pertussis (whooping cough)** – high contagious disease that caused uncontrollable, violent coughing
- **Rocky Mountain Spotted Fever –** bacteria spread by ticks – chills, fever, rash
- **Strep throat** – most common bacterial infection of the throat – streptococcus bacteria
- **Syphilis** – sexually transmitted infectious disease spread through broken skin or mucus membranes
- **Tetanus – (lockjaw)** – bacteria enters through contaminated wound – affects skeletal muscles and nerves – prolonged muscle fiber contractions
- **Tuberculosis –** contagious infection of the lungs that spreads through the ari

FUNGAL DISEASES - The first step in treatment of fungal is prevention. Prevention measures include maintaining good oral, foot and skin hygiene. People at risk for fungal infections include those taking strong antibiotics for a long period of time. Antibiotics kill bacteria, including normal flora, which can alter the balance of microorganisms in the mouth, vagina, intestines and other places in the body and may result in an overgrowth of fungus. Antifungal medications are available as topical agents or pills.

- **Athlete's foot –** infection of the feet
- **Dutch Elm Disease** – fungus on elm trees
- **Ergotism** – fungus in rye
- **Histoplasmosis –** enters a person's lungs from breathing airborne particles
- **Potato Blight** – fungus on potatoes
- **Ringworm –** infection of skin, scalp, groin and hands
- **Thrush** – infection of the mouth, throat, and tongue

PROTOZOAN/ ALGAL DISEASES – Protozoan parasites as those causing malaria are cause tremendous sickness, death, mutilation, and debilitation in the world. They multiply in their human hosts, increasing in number to cause overwhelming infection. Some types of marine dinoflagellates produce algal blooms (red tide) as well as toxins which can be taken in by filter feeders and contaminate organisms eaten by humans or kill fish.

- **Malaria** – sporozoan protozoan
- **Estuary Associated Syndrome** - dinoflagellate
- **Paralytic Shellfish Poisoning** – dinoflagellate
- **Giradiasis**- infection of the small intestines caused by protozoan ***Girdiasis lamblia***- one of the chief causes of diarrhea in US
- **Cryptosporidiosis** - intestinal illness caused by protozoan parasite ***Cryptosporidium*** causing watery diarrhea and often abdominal cramping

PRION DISEASE – ultramicroscopic proteinaceous infectious particles, associated with a number of diseases characterized by loss of motor control, dementia, paralysis, wasting and eventually death

- **Scrapie – fetal** neurodegenerative disease of the central nervous system in sheep and goats
- **Kuru –**disease in humans **caused by a fatal neurodegenerative prion** causing rapid deterioration of mental function and loss of muscle coordination.

PARASITIC WORMS – include round worms, flatworms, and flukes. Most have complex life cycles that involve substantial time outside their human hosts.

- **Hookworm –** parasitic nematode that lives in small intestine of its host
- **Pinworm –** small intestinal parasitic nematode - especially in children
- **Schistosomiasis –** parasitic trematodes (flukes)- larval forms released into freshwater by snails
- **Tapeworm –** intestinal parasitic flatworm
- **Trichinosis –** parasitic intestinal round roundworm ingested from eating undercooked meat especially pork

NATIONAL TOURNAMENT ADDITIONS

IMPORTANT GENERA as infectious agents

- ***Wolbachia*** – bacteria who infect arthropods insects ~ 60 % of insects affecting their ability to reproduce
- ***Batrachochytrium*** - fungus causing rapid worldwide decline in amphibians.