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ENVIRONMENTAL STUDIES & LIFE SCIENCES

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ENVIRONMENTAL STUDIES & LIFE SCIENCES

Types of Infectious diseases

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Infectious diseases

Significantly contribute to the mortality in

- Elderly
- Immunosuppressed
- Chronic disease states

How microorganisms cause disease?

- Humans harbor a complex ecosystem of microflora.
- Attenuation of normal host- defense healthy” microbial flora to cause pathologic infections.
- Non-commensal organisms with a wide range of virulence.
- Highly infectious microbes produce disease in healthy individuals.

Bloodborne Diseases:

- HIV/AIDS.
- Hepatitis B and C.

- Bacterial:
 - “Staph” skin infection.
 - Pneumonia.
 - Urinary tract infection.
 - Anthrax
 - Botulism
- Parasitic: Malaria
- Viral:
 - Influenza, or the flu.
 - Respiratory infections.
 - Diarrhea.
 - Chickenpox, measles, mumps.
- Fungi:
 - Candidosis, Aspergillosis.

Infectious diseases: Definitions

- **Disease:** A pathological condition of body parts or tissues characterized by an identifiable group of signs and symptoms.
- **Infectious disease:** Disease caused by an infectious agent such as bacteria, virus, fungi, protozoa that can be passed on to others.
- **Infection:** Occurs when an infectious agent enters the body and begins to reproduce; may or may not lead to disease.
- **Pathogen:** An infectious agent that causes disease.
- **Host:** An organism infected by another organism.
- **Virulence:** The relative ability of an agent to cause rapid and severe disease in host.

Phases of infectious disease

- 1. Incubation period:** time between infection and the appearance of signs and symptoms.
- 2. Prodromal phase:** mild, nonspecific symptoms that signal onset of some diseases.
- 3. Clinical phase:** a person experiences typical signs and symptoms of disease.
- 4. Decline phase:** subsidence of symptoms.
- 5. Recovery phase:** symptoms have disappeared, tissue heal and the body regains strength.

Classification of disease

□ By duration

- *Acute: develop and runs its course rapidly
- *Chronic: develops more slowly and it usually less severe may persist for a long, indefinite period of time.
- *Latent: characterized by periods of no symptoms between outbreaks of illness.

□ By location

- *Local: confined to a specific area of the body
- *Systemic: a generalized illness that infect most of the body

□ By timing

- *Primary: initial infection in the previously healthy person
- *Secondary: infection that occurs in a person weakened by primary infection

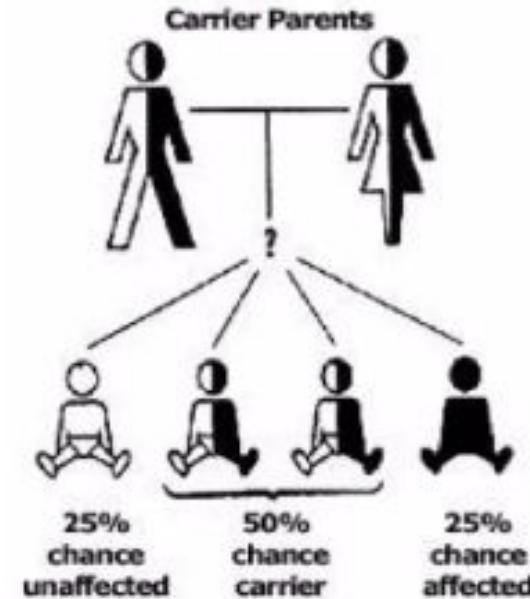
Types of Infectious diseases

Table 14.10 Modes of Disease Transmission

Mode of Transmission	Diseases Spread Include:
Contact Transmission	
Direct Contact: e.g., handshaking, kissing, sexual intercourse, bites	Cutaneous anthrax, genital warts, gonorrhea, herpes, rabies, staphylococcal infections, syphilis
Indirect Contact: e.g., drinking glasses, toothbrushes, toys, punctures	Common cold, enterovirus infections, influenza, measles, Q fever, pneumonia, tetanus
Droplet transmission: e.g., droplets from sneezing (within 1 meter)	Whooping cough, streptococcal pharyngitis (strep throat)
Vehicle Transmission	
Airborne: e.g., dust particles	Chickenpox, coccidiomycosis, histoplasmosis, influenza, measles, pulmonary anthrax, tuberculosis
Waterborne: e.g., streams, swimming pools	Campylobacter infections, cholera, Giardia diarrhea
Foodborne: e.g., poultry, seafood, meat	Food poisoning (botulism, staphylococcal); hepatitis A, listeriosis, tapeworms, toxoplasmosis, typhoid fever
Vector Transmission	
Mechanical: e.g., (on insect bodies) flies, roaches	<i>E. coli</i> diarrhea, salmonellosis, trachoma
Biological: e.g., lice, mites, mosquitoes, ticks	Chagas' disease, Lyme disease, malaria, plague, Rocky Mountain spotted fever, typhus fever, yellow fever

Diseases

- Genetic
- Biological
- Physical
- Chemical



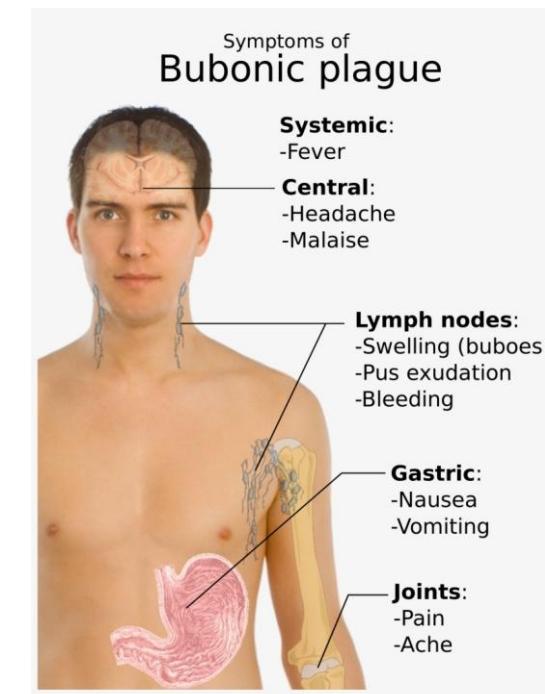
Types of Infectious diseases

Epidemics of

- Plague in India
- Avian (H5N1) influenza in Hong Kong
- Ebola haemorrhagic fever in central Africa
- Nipah virus (niv) infection in Malaysia and Singapore required national and international response.

Plague: Also called as Black Death

- *Yersinia pestis* causes plague. Transmitted from rodents to human by aerosols or fleabites.
- There are two main clinical forms of plague infection: bubonic and pneumonic.
- Bubonic plague is the most common form and is characterized by painful swollen lymph nodes or 'buboës'.
- The lymph node then becomes inflamed, tense and painful, and is called a 'bubo'.
- Inflamed lymph nodes can turn into open sores filled with pus.
- **Pneumonic plague**, or lung-based plague, is the most virulent form of plague.



Anthrax

- *Bacillus anthracis* causes anthrax in human.
- These are prevalent in animals having contact with spore-contaminated soil.
- Human in contact through exposure to contaminated animal products or powdered spores (called as a biologic weapon) suffer from anthrax.
- 3 major syndromes:
 - Cutaneous: painless, pruritic papules that become edematous vesicles (lymphadenopathy & lymphangitis) followed by a black eschar.
 - Inhalation: flu like symptoms rapidly leads to sepsis, shock, and frequently death.
 - GI: by eating contaminated meat, causes severe, bloody diarrhoea and often death.



Small pox

- acute contagious disease caused by the *Variola* virus
- **high fever which may be recurrent.**
- **malaise** (general feeling of unwellness)
- **widespread skin rash** – flat spots which change into raised bumps then firm fluid filled blisters which then scab
- **severe headache.**
- **backache.**
- **abdominal pain.**
- **vomiting.**
- **diarrhoea.**



Types of Infectious diseases

Influenza

- Acute contagious disease caused by influenza virus.
- Causes respiratory tract infection but symptoms throughout the body.
- Seasonal causes epidemics with low fatality. More deadly during pandemics and occur several times.
- Rapid onset, chills, fever, malaise/fatigue, headache, sore throat, cough, nasal congestion, & GI symptoms



Viral Hemorrhagic Fever

- Viral hemorrhagic (hem-uh-RAJ-ik) fevers are infectious diseases. Cause severe, life-threatening illness.
 - They can damage the walls of tiny blood vessels, making them leak, and can hamper the blood's ability to clot internal bleeding.
- Early signs and symptoms can include:
Fever, Fatigue, weakness or general feeling of being unwell, Dizziness, Muscle, bone or joint aches, Nausea and vomiting, Diarrhoea
Some viral hemorrhagic fevers include:

- 1.Dengue
- 2.Ebola
- 3.Lassa
- 4.Marburg
- 5.Yellow fever

□ Severe symptoms include:

Bleeding under the skin, in internal organs, or from the mouth, eyes or ears, Nervous system malfunctions, Coma, Delirium, major organ failure.

VIRAL HEMORRHAGIC FEVERS



<https://www.slideshare.net/ChristianAmarvi/viral-hemorrhagic-fever>

Tularaemia

- Tularaemia, also known as “rabbit fever,” is a disease caused by the bacterium *Francisella tularensis*.
- Tularaemia is typically found in animals, especially rodents, rabbits, and hares. Tularaemia is usually a rural disease and has been reported in all U.S. states except Hawaii.
- Symptoms: Rapid onset, fever, dyspnoea , headache, malaise, cough, hemoptysis (coughing up blood).



Botulism

- *Clostridium botulinum* is a bacterium that produces dangerous toxins (botulinum toxins) under low-oxygen conditions.
- Botulinum toxins block nerve functions and can lead to respiratory and muscular paralysis.
- Foodborne botulism is a serious, potentially fatal disease.
- Improperly processed food, homemade canned, preserved or fermented foodstuffs are a common source of foodborne botulism.

Symptoms: fatigue, weakness, blurred vision, difficulty in swallowing and speaking, descending muscle paralysis and respiratory failure.



Malaria

- ***Plasmodium falciparum*** causes severe malaria.
- ***Plasmodium vivax, Plasmodium ovale, and Plasmodium malariae*** are the various types of disease causing vectors.
- Malaria infection begins when an infected female ***Anopheles*** mosquito bites a person, injecting *Plasmodium* parasites, in the form of sporozoites into the bloodstream.
- The **sporozoites** pass quickly into the **human liver**.
- The sporozoites multiply asexually in the liver cells over the next 7 to 10 days, causing no symptoms.
- In an animal model, the parasites, in the form of **merozoites** are released from the liver cells in vesicles, **passes through the heart, lungs, and settle within lung capillaries**.

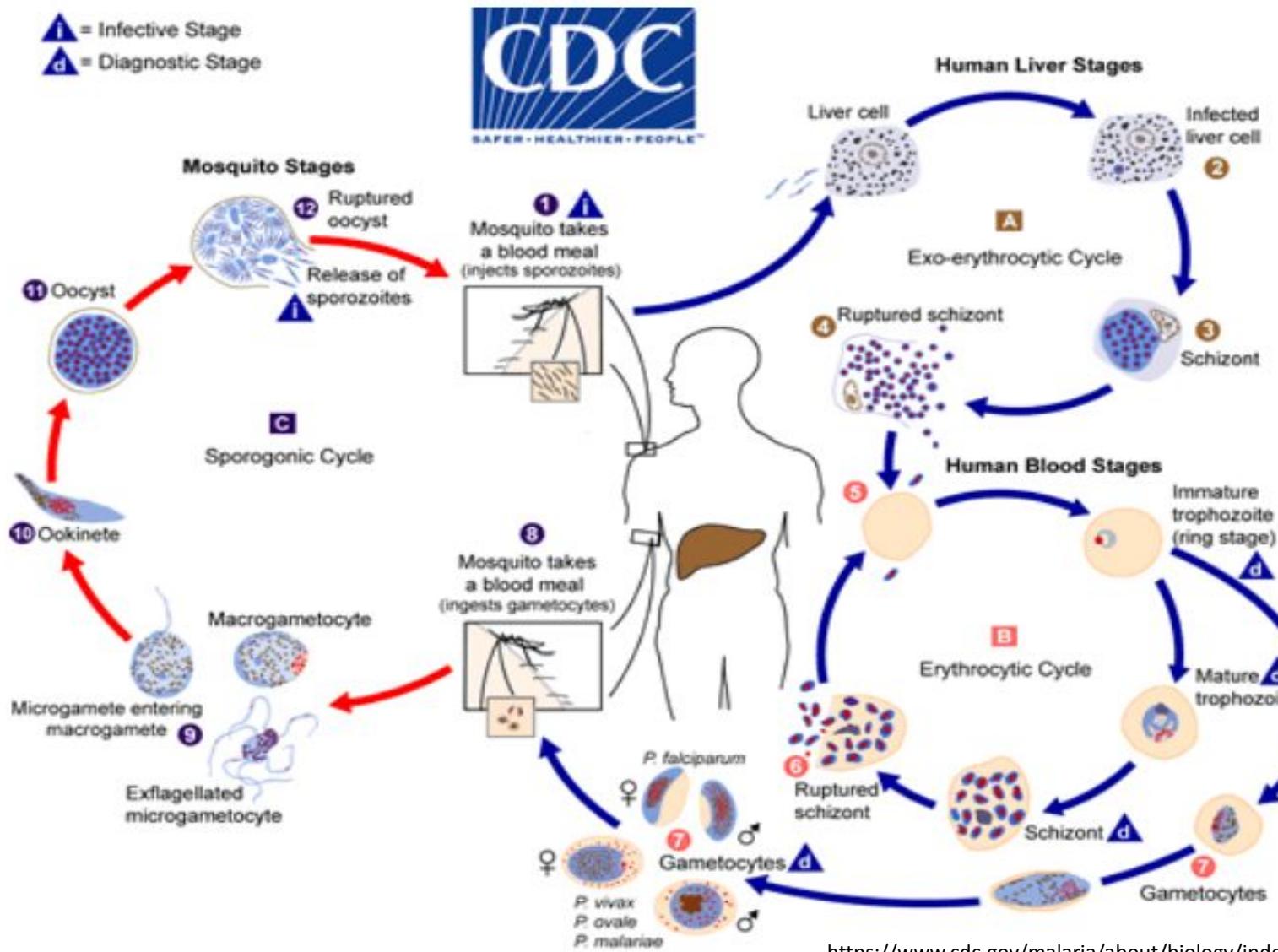
- The vesicles disintegrate, free the merozoites to enter the blood phase of their development.
- In the bloodstream, the merozoites invade red blood cells (**erythrocytes**) and multiply again until the cells burst. Then they invade more erythrocytes. This cycle is repeated, causing fever each time parasites break free and invade blood cells.
- Some of the infected blood cells leave the cycle of asexual multiplication. Instead of replicating, the merozoites in these cells develop into sexual forms of the parasite, called gametocytes that circulate in the blood stream.

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- When a mosquito bites an infected human, it ingests the gametocytes, which develop further into mature sex cells called gametes.
- The fertilized female gametes develop into actively moving ookinetes that burrow through the **mosquito's midgut wall and form oocytes on the exterior surface**.
- Inside the oocyst, thousands of active sporozoites develop. The oocyst eventually bursts, releasing sporozoites into the body cavity that **travel to the mosquito's salivary glands**.
- **The cycle of human infection begins again when the mosquito bites another person.**

Types of Infectious diseases

i = Infective Stage
d = Diagnostic Stage



Watch and Enjoy:

<https://www.youtube.com/watch?v=GfePed0F-f0>

Bioterrorism acts and their functions.

ACTS	COUNTRY	YEAR	FUNCTIONS
The Pandemic and All-Hazards Preparedness Act (PAHPA)	United States	2006	Improve the nation's public health, medical preparedness and response capabilities in emergencies.
Public Readiness and Emergency Preparedness Act (PREP Act)	United States	2005	Protects from liability claims arising from administration, vaccine manufacturers, distributors, program planners, and qualified persons involved in the administration.
Biodefense and Pandemic Vaccine and Drug Development Act	United States	2005	Provides incentives for domestic manufacturing of vaccines and broad liability protections to the companies.
The Project Bioshield Act	United States	2004	Provides permanent funding for the procurement of medical countermeasures during emergencies.
Public Health Security and Bioterrorism Preparedness and Response Act (Bioterrorism Act)	United States	2002	Issue regulations on enhancing controls on dangerous biological agents and toxins, protecting safety and security of food and drug supply, drinking water Security and safety.
Homeland Security Act	United States	2002	Create the Department of Homeland Security (DHS), that prevent or minimize damage and assist in recovery for terrorist attacks
USA Patriot Act	United States	2001	Uniting and strengthening America by providing appropriate tools required to intercept and obstruct terrorism
Chemical and Biological Weapons Control Act	United States	1991	Strengthen efforts to control chemical and biological agents, precursors, and equipment.



THANK YOU

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