Al-Mustaqbal University / Nursing College
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Epidemiology

Lecture 3

Epidemiologic triad

By

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Epidemiologic triad

- The science of epidemiology draws on certain basic concepts and principles to analyze and understand patterns of occurrence among aggregate health conditions.

Epidemiologic triad

The epidemiology model promote understanding the relationship between

- **Host**
- **Agent**
- **environment.**

The interrelationship of these elements results in a state of illness.

Host

The host susceptible human or animal who ports and nourish a disease-causing agent.

Many physical psychological and lifestyle factors influence the host weakness and response to an agent.

Factors influence the host

1-Physical factor: include age, gender, and genetic factor influence on the host resistance.

2-Psychological factor: such as people outlook and response to stress, can be strongly influence on host exposure.

3-Life style factor: that play major role include diet, exercise, sleep pattern, healthy and unhealthy habits all contribute to decrease or increase weakness to the disease causing agent.

Agent

Agent:

is a factor that causes or contribute to health condition or problems. Causative agent can be present such as bacterial that cause tuberculosis or lacking of iron in the body that cause anemia.

Types of Agents

Agents can be classified into six types:

1-Biological agent :that include bacterial, viral, fungi, protozoa, worms and insects.

2-Chemial agent: may in the form of liquid, soils, gases, dusts.

3-Nutreint agent: include essential dietary components which if deficiency or taken in excess can product illness.

4-Physical agent: include anything mechanical, material, radiation that causes injury to human.

5-Psychological agent : are events producing stress that lead to health problems.

6. Genetic agents :arise from genetic transmission from parent to child

TABLE 3-1 Agents and Selected Health Problems to Which They Contribute

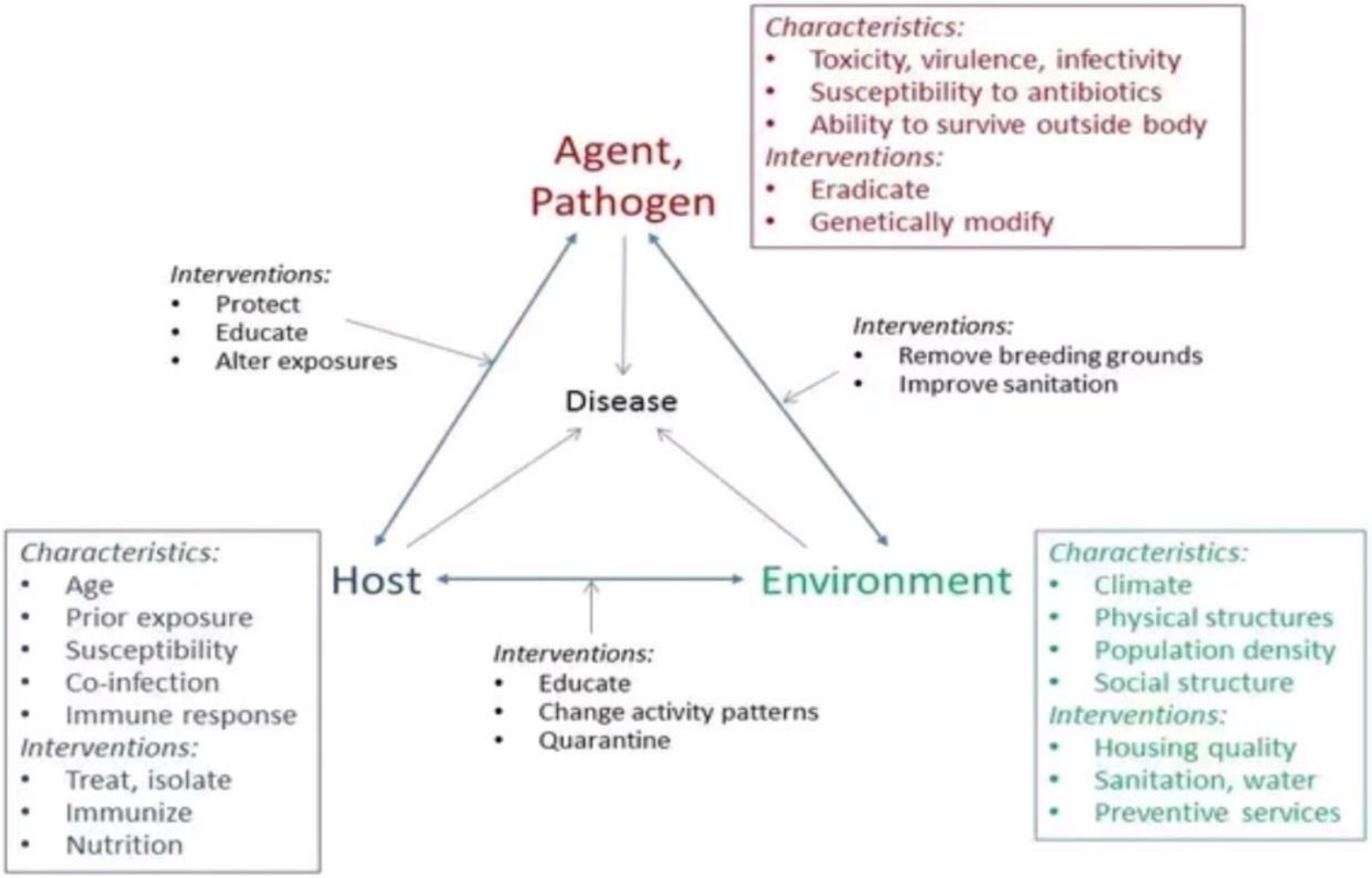
Type of Agent	Example	Problems
Physical	Heat	Burns, heat stroke
	Trauma	Fractures, concussion, sprains, contusions
	Radiation	Genetic changes
Chemical	Medications	Accidental poisoning, suicide
	Chlorine	Poisoning, asphyxiation (in gas form)
	Poison ivy	Rash and pruritus
Nutritive	Vitamin C	Scurvy (in absence of vitamin C)
	Iron	Anemia (in absence of iron)
	Vitamin A	Poisoning (in excess)
Infectious	Measles virus	Measles, measles encephalitis
	HIV	AIDS
	Varicella virus	Chickenpox
	Influenza virus	Influenza
Genetic	Genetic predisposition to disease	Sickle cell disease
	Genetic abnormality	Down syndrome, Turner's syndrome
Psychological	Stress	Ulcerative colitis, heart disease, suicide, asthma, alcoholism, drug abuse, violence

Environment

Environment: The environment refers to all external factors surrounding the host that might influence weakness or resistance.

1-physical environment: include factors like geography, climate ,weather, safety building.

2-psychological environment: refer to culture social and economic and psychological influence and condition that effect health.


Agent, Pathogen
Characteristics:
• Toxicity, virulence, infectivity
• Susceptibility to antibiotics
• Ability to survive outside body
Interventions:
• Eradicate
• Genetically modify
Interventions:
• Protect
• Educate
• Alter exposures
Interventions:
• Remove breeding grounds
• Improve sanitation
Disease
Host
Environment
Characteristics:
• Age
• Prior exposure
• Susceptibility
• Co-infection
• Immune response
Interventions:
• Treat, isolate
• Immunize
• Nutrition
Interventions:
• Educate
• Change activity patterns
• Quarantine
Characteristics:
• Climate
• Physical structures
• Population density
• Social structure
Interventions:
• Housing quality
• Sanitation, water
• Preventive services

- **Epidemiologic Triangle for COVID-19**
- The National Institute for Health has broken down how the triangle can be applied to COVID-19.
- First epidemiologists have to identify the three vertices of the triangle:
- **Agent:** A type of virus called a coronavirus, identified as SARS-CoV-2. (Severe acute respiratory syndrome coronavirus 2)
- **Host:** Humans, especially those with comorbidities, and older adults.
- **Environment:** SARS-CoV-2 spreads through droplets in the air and on surfaces

Chain of Causation

The chain begins by

Reservoir: Any human beings, animals, plants in which an infectious agent normally lives and multiplies and from which it passes to a new host.

EX; plague, that reservoir may be other humans, rats,, and a few other animals.

malaria, infected humans are the major reservoir for the parasitic

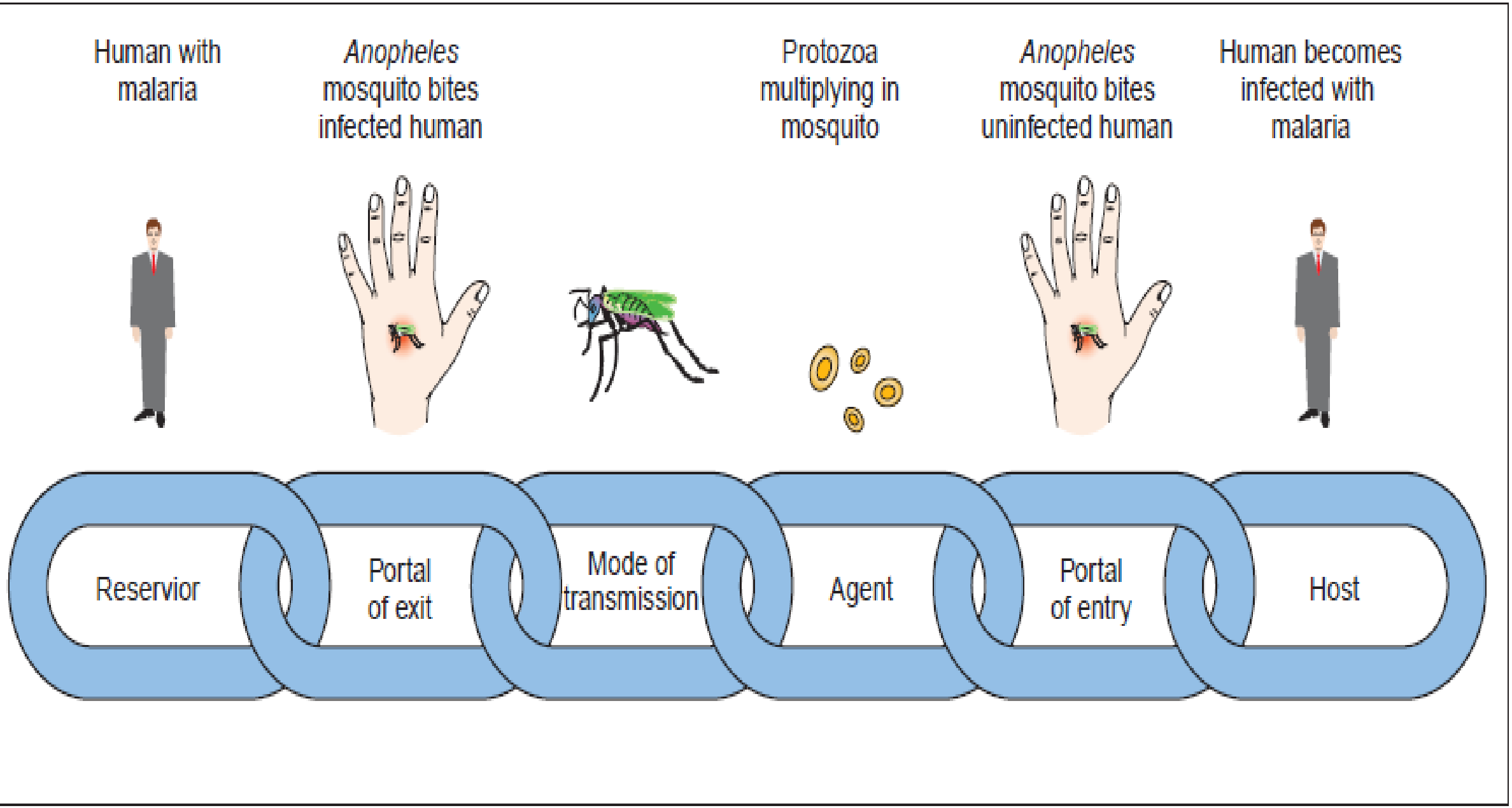
Chain of Causation

- Next, the agent must have a **portal of exit** from the reservoir, as well as some **mode of transmission.**
- For example, the bite of an Anopheles mosquito provides a portal of exit for the malaria parasites
- Mosquito in this case is the **mode of transmission.**

Chain of Causation

The next link in the chain of causation is the **agent itself**.

The next link is the **portal of entry**. In the case of malaria, the mosquito bite provides a portal of exit as well as a portal of entry into the human **host**.


Human with malaria
Anopheles mosquito bites infected human
Protozoa multiplying in mosquito
Anopheles mosquito bites uninfected human
Human becomes infected with malaria
Reservior
Portal of exit
Mode of transmission
Agent
Portal of entry
Host

Mode of transmission:

The way disease agents are transmitted from the source of infection to new hosts by the following :

1. Droplet contact route – coughing or sneezing on another individual

2. Direct physical contact route direct contact infections spread when disease-causing microorganisms pass from the infected person to the healthy person via direct physical contact with blood or body fluids. Examples of direct contact are touching, kissing, sexual contact, contact with oral secretions, or contact with body lesions

3. Indirect physical contact route: touching a contaminated surface, including soil

4. Airborne route

5. Fecal-oral route

6. Transmission by insect or animal bite

Communicable diseases classification in epidemiology:

- 1**)Endemic**: when an infectious agent or disease has a constant presence within a defined geographic area.

- **2) Epidemic**: occurrences of infectious agent or disease that clearly exceed the usual expected frequency of the disease in a particular population.

- **3) Pandemic**: when an epidemic outbreak occurs worldwide.

Control measures to stop the epidemic.

1-attack the source and the mode of transmissions.

2-treat and isolate all cases .

3-increase resistance of local population.

4-continue surveillance to ensure that control measures have been effective .

- ***What are the health risks:***

- Communicable diseases are a major cause of mortality and morbidity in disaster situations, particularly, where there is:

- population displacement
- collapsing health services
- lack of disease control programmers'
- poor access to health care in urban and/or rural areas
- malnutrition
- interrupted supplies and logistics
- poor coordination among agencies

THANK YOU