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College Of Medicine



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The background of the slide is a dark teal color with a microscopic theme. It features several 3D-rendered pathogens: a large, red, multi-lobed virus-like particle on the right; a smaller, blue, spherical virus with surface proteins in the upper right; and various other blue and green cellular or viral structures scattered throughout. The text 'Infectious' is in a white, italicized serif font, and 'DISEASES' is in a large, bold, yellow sans-serif font.

Infectious **DISEASES**

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Objectives:

- **Historical Perspective**
- **The impact of infectious disease nationally & internationally.**
- **Definition of infection.**
Eradication & resurgence of infectious diseases.
- **Definitions of epidemiological terms.**
- **The effects of infection.**
- **Discuss methods of transmission**
- **Discuss methods of prevention**
- **The immunity against infectious agents.**

HISTORICAL PERSPECTIVE

- **The notion that communicable diseases were due to a miasma (“bad air”) can be traced back to at least the mid-sixteenth century.**
- **Not until the work of Louis Pasteur and Robert Koch in the late nineteenth century was there credible evidence supporting the germ theory of disease—i.e., that microorganisms are the direct cause of infections.**
- **In contrast to this relatively slow start, the twentieth century saw remarkable advances in the field of infectious diseases, and the etiologic agents of numerous infectious diseases were soon identified. Furthermore, the discovery of antibiotics and the advent of vaccines against some of the most deadly and debilitating infections greatly altered the landscape of human health.**

Infectious diseases :

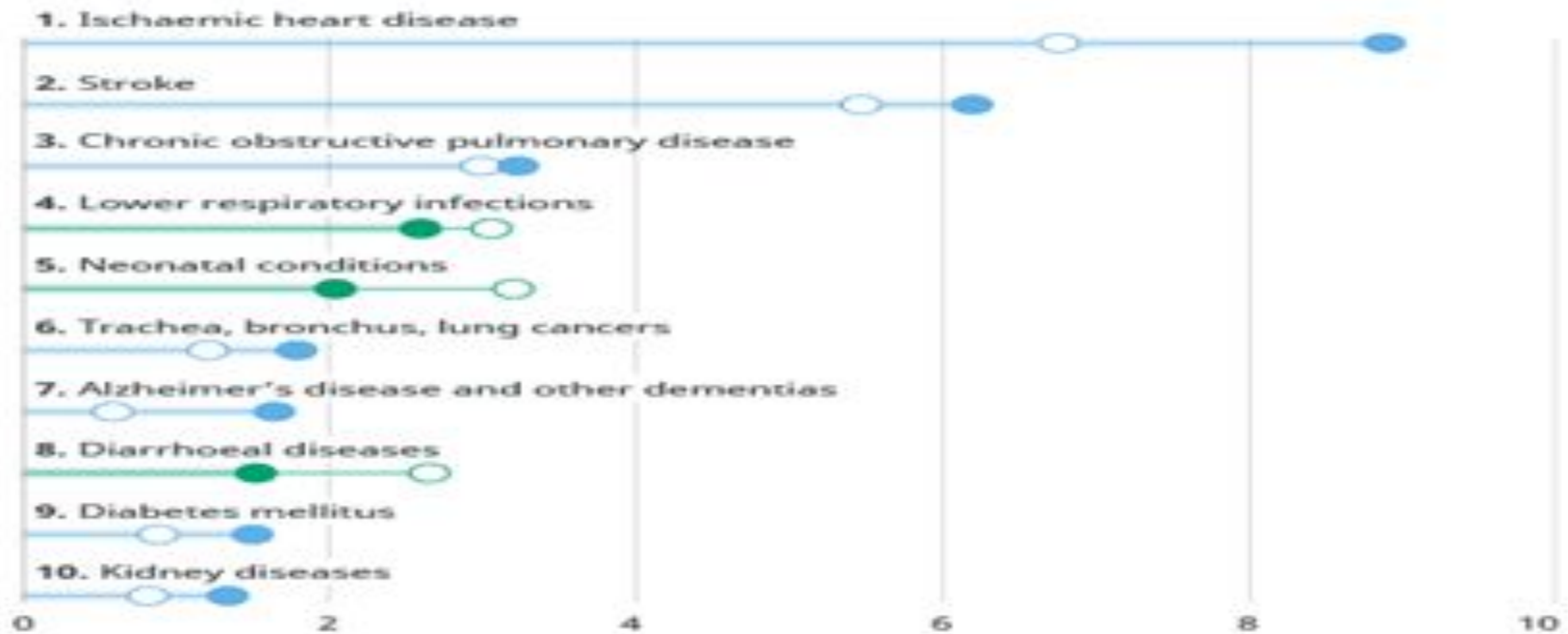
Critical world health problems

- **Critical world health problems still exist and include:**
 1. **Communicable diseases such as COVID 19, Pandemic influenza H5N1,H1N1, tuberculosis, measles, mumps, rubella, and polio.**
 2. **Maternal and Child Health**
 3. **Diarrheal diseases**
 4. **Nutritional deficits**
 5. **Malaria**
 6. **AIDS**

2.6 million(COVID-19) deaths till 21-1-2021

Leading causes of death globally

○ 2000 ● 2019



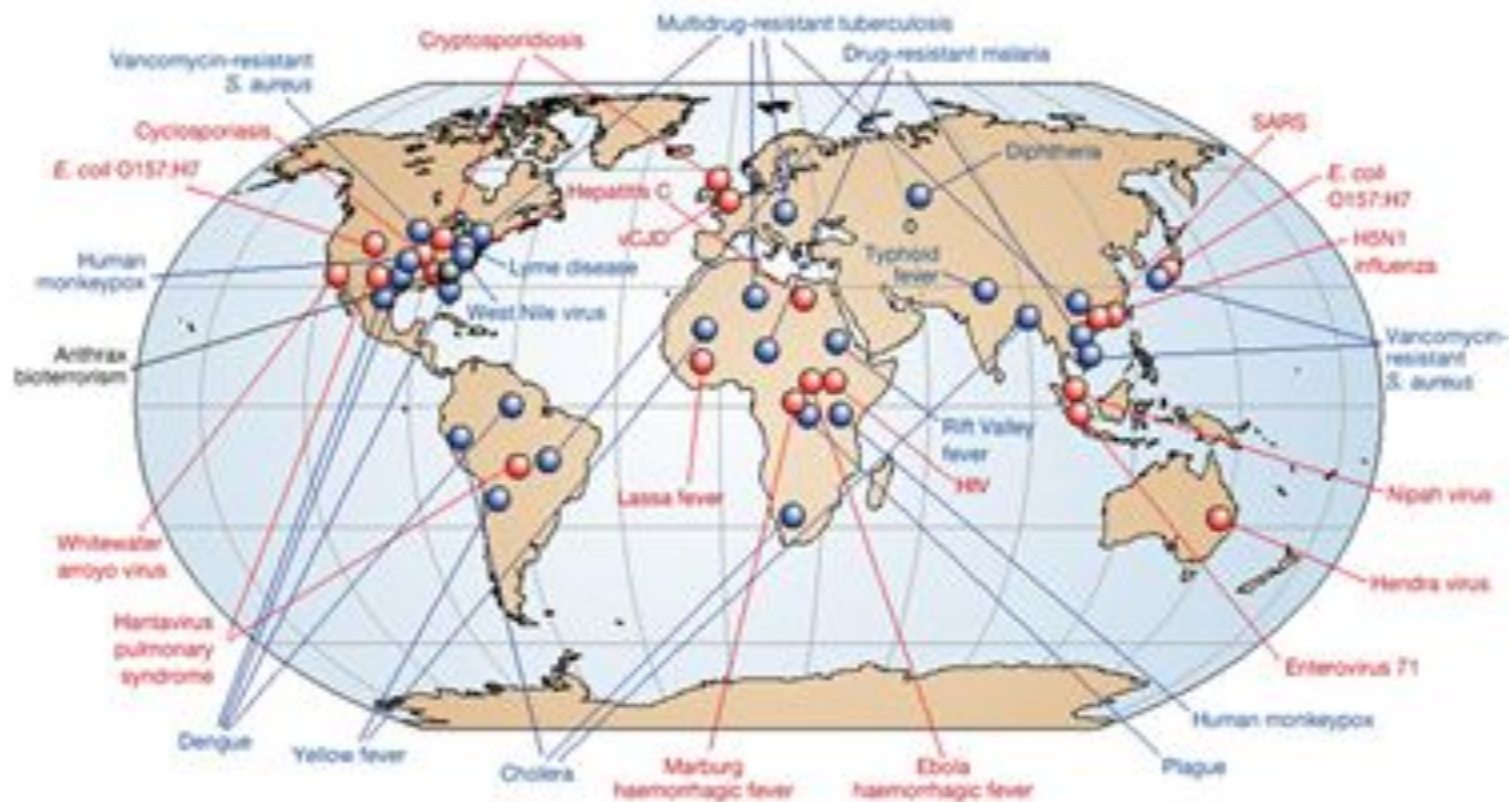
Emerging infectious disease

- **Newly identified & previously unknown infectious agents that cause public health problems either locally or internationally.**
- **>2/3rd emerging infections originate from animals- wild & domestic.**

Re-emerging infectious disease

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- **Infectious agents that have been known for some time, had fallen to such low levels that they were no longer considered public health problems & are now showing upward trends in incidence or prevalence worldwide.**

Examples of recent emerging diseases



Source: NATURE; Vol 430; July 2004;
www.nature.com/nature
Dr. KANUPRIYA CHATURVEDI

Resurgence of infectious diseases

- **Approximately 75 percent of emerging pathogens are *zoonotic*, that is, communicated by animals to humans. When humans encroach upon a rainforest, they become exposed to viruses and other microbes that they otherwise would not have encountered. COVID-19, HIV/AIDS, avian influenza, Zika, SARS, and Ebola are all the result, to a greater or lesser extent, of interactions with animals that led to the emergence and re-emergence of deadly diseases.**
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Association of infectious cause with cancer

- In fact, ~16% of all malignancies are now known to be associated with an infectious cause.
- the most notable examples are the associations of *Helicobacter pylori* with peptic ulcer disease and gastric carcinoma.
- Human papillomavirus with cervical cancer.
- Hepatitis B and C viruses with liver cancer.
- AIDS-related Kaposi's Sarcoma

Definitions and Terms

- 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 a bacterium, virus, protozoan, or fungus 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 a host.

Definition of communicable diseases

- **A communicable disease is an illness due to a specific infectious (biological) agent or its toxic products capable of being directly or indirectly transmitted from man to man, from animal to man, or from the environment (through air, water, food, etc..) to man.**
 - **1,415 microbes are infectious for human**
 - **Of these, 868 (61%) considered zoonotic**
 - **70% of newly recognized pathogens are zoonoses**
-

Infestation

- **It is the lodgment, development and reproduction of arthropods on the surface of the body or in the clothing, e.g. lice, itch mite. This term could be also used to describe the invasion of the gut by parasitic worms, e.g. ascariasis.**

Contagious disease

- **A contagious disease is the one that is transmitted through contact. Examples include scabies, trachoma, STD and leprosy.**

How Infectious Agents Cause Disease

- Production of poisons, such as toxins and enzymes, that destroy cells and tissues.
- Direct invasion and destruction of host cells.
- Triggering responses from the host's immune system leading to disease signs and symptoms.
- Derangement of normal physiological functions of organs or organelles.

Phases of infectious diseases

- Incubation period – time between infection and the appearance of signs and symptoms.
- Prodromal phase – mild, nonspecific symptoms that signal onset of some diseases.
- Clinical phase – a person experiences typical signs and symptoms of disease.
- Decline phase - subsidence of symptoms.
- Recovery phase – symptoms have disappeared, tissues heal, and the body regains strength.

Classification of infectious diseases

By duration

- Acute – develops and runs its course quickly.
- Chronic – develops more slowly and is usually less severe, but 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 infects most of the body with pathogens distributed widely in tissues.

By timing

- Primary – initial infection in a previously healthy person.
- Secondary – infection that occurs in a person weakened by a primary infection.

Important Emerging and Re-emerging Diseases

was first described in the scientific literature in June .

Malaria

is one of those diseases that most people in the developed world just do not think about. Yet more than one million people with malaria die each year. Every 30 seconds, a child dies of malaria.

Tuberculosis

is another major killer, causing the deaths of about two million people each year.

Influenza

as common as it is, is a greatly misunderstood disease. Each year we confront seasonal, or interpandemic

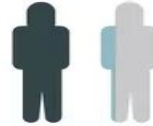
How seasonal flu and Covid-19 compare

FLU

COVID-19

RO number

Estimate of how many people will be infected by an average individual with the disease



1.3



2-2.5

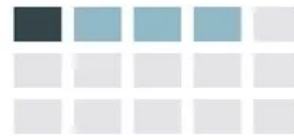
Bottom of the range

Top of the range

Incubation time

The time from exposure to first symptoms

DAYS



1-4



1-14

Hospitalization rate

Average percentage for total cases



2%



19%

Case fatality rate

Percentage of reported deaths among total cases

.1% or less

1-3.4%

Epidemiologic triad

- **Age, sex, genetic factor**
- **Concomitant disease**
- **as diabetes mellitus**
- **immunity**

Host

Agent

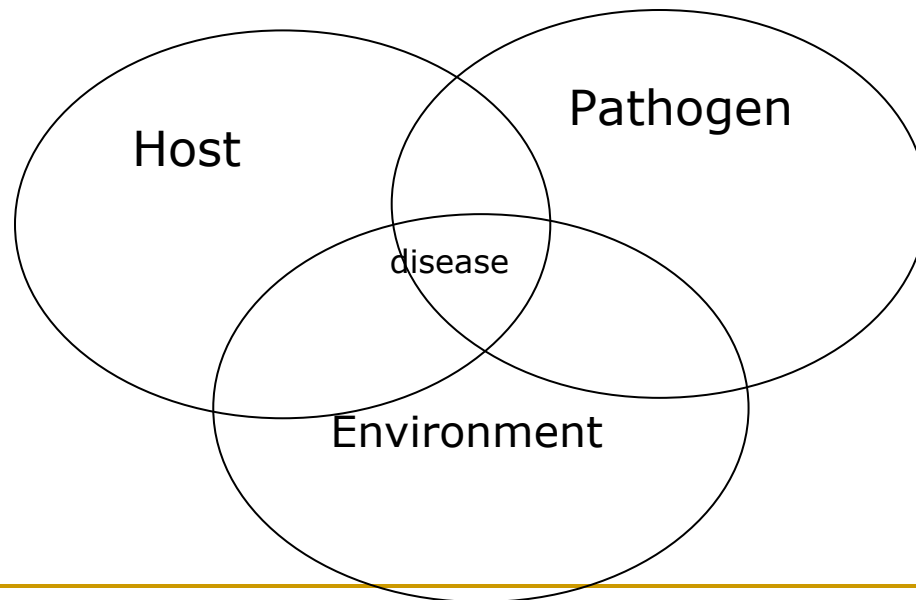
- **Dose of inoculum**
- **Virulence**
- **Toxins**

Environment

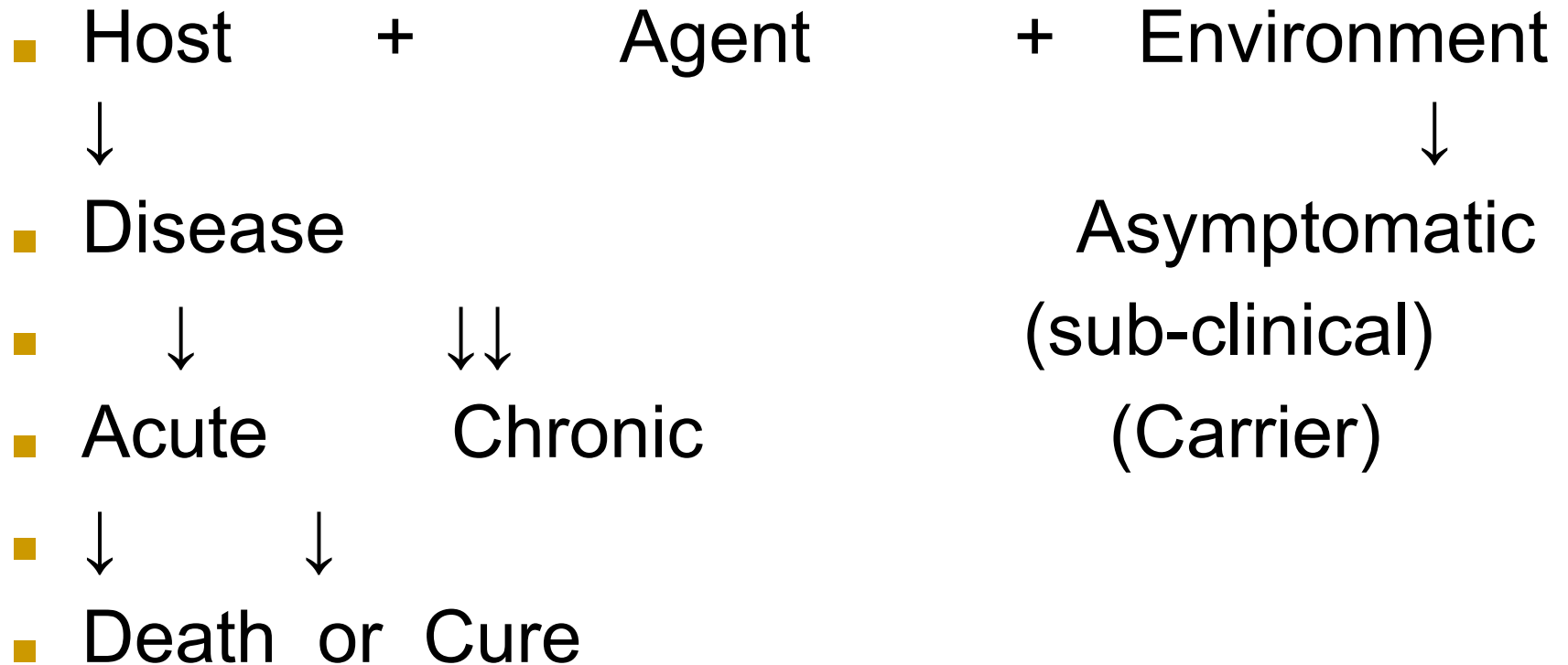
- **Physical environment**
- **Temperature, humidity**
- **Biological environment**
- **Social environment**

Infectious Disease Model

- The outcome of infection depends on interaction between the 3 factors

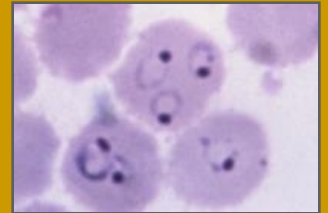
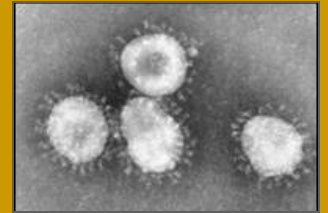


Out come of infection



Infectious Disease Agents

- Most infectious agents that cause disease are microscopic in size and thus, are called microbes or microorganisms.
- Different groups of agents that cause disease are:
 - Bacteria
 - Viruses ,Brion
 - Protozoa (Protists)
 - Fungi



Courtesy of CDC



Transmission of Infectious Dis

- Agents that cause infectious diseases can be transmitted in many ways.
 - Through the air
 - Through contaminated food or water
 - Through body fluids
 - By direct contact with contaminated objects
 - By animal vectors such as insects, birds, bats, etc.



Courtesy of VOA

Chinese students
wearing masks during a
SARS outbreak

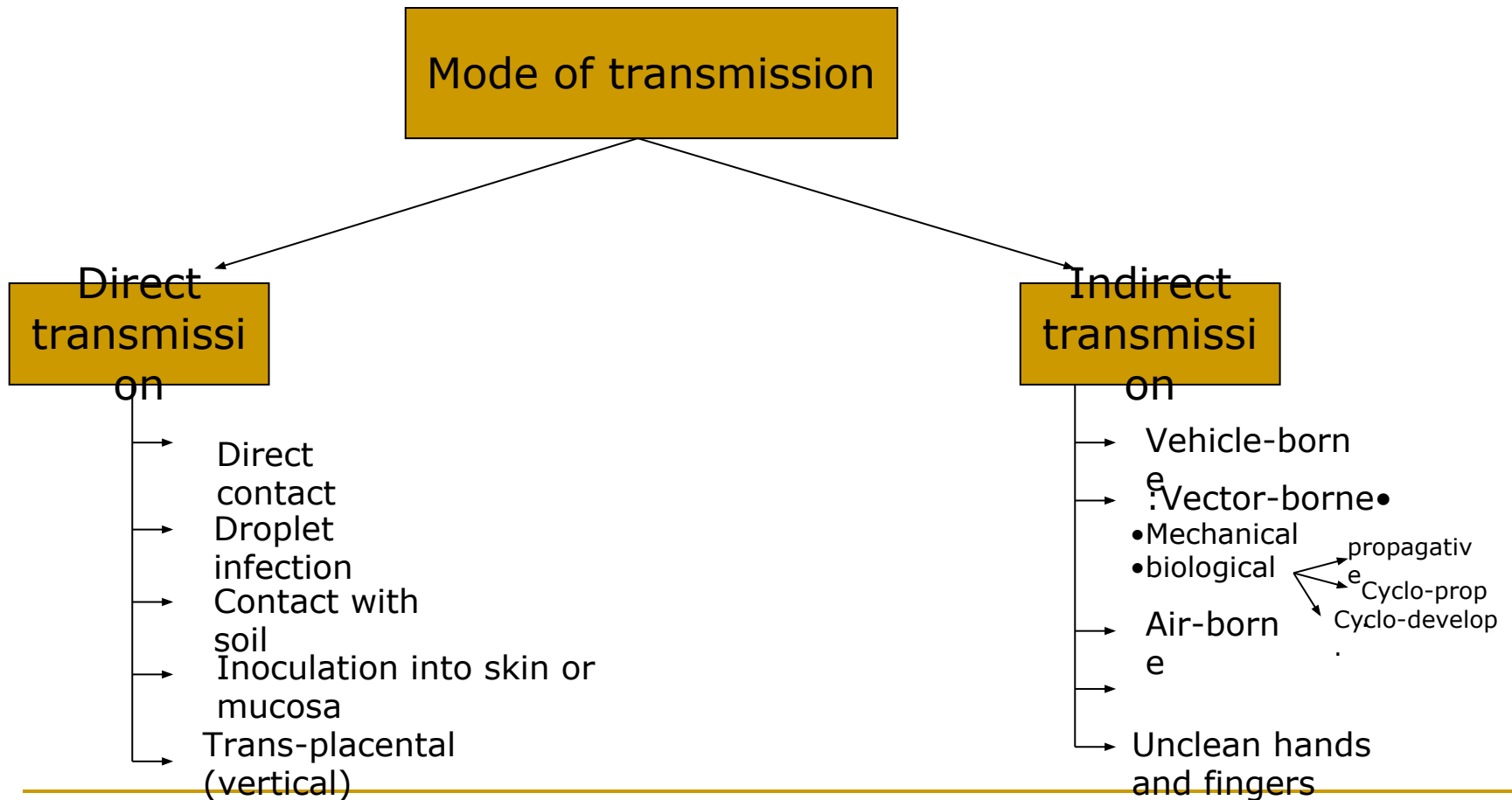


Courtesy of CDC

Aedes aegypti mosquito
Known to transmit
Dengue fever



Modes of transmission



Sexually Transmitted Diseases

- **Chlamydia**
- **Gonorrhea**
- **Genital Herpes**
- **Syphilis**
- **HIV/AIDS**

Epidemic

- “The unusual occurrence in a community of disease, specific health related behavior, or other health related events clearly **in excess of expected occurrence**”
 - (epi= upon; demos= people)
 - Epidemics can occur upon endemic states too.
-

Endemic

- It refers to the constant presence of a disease or infectious agent within a given geographic area or population group. It is **the usual or expected frequency of disease** within a population.
 - (En = in; demos = people)
-

Hyperendemic and holoendemic

- The term “hyperendemic” expresses that the disease is constantly present at high incidence and/or prevalence rate and affects all age groups equally.
 - The term “holoendemic” expresses a high level of infection beginning early in life and affecting most of the child population, leading to a state of equilibrium such that the adult population shows evidence of the disease much less commonly than do the children (e.g. malaria)
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Pandemic and Exotic

- An epidemic usually affecting a large proportion of the population, occurring over a wide geographic area such as a section of a nation, the entire nation, a continent or the world, e.g. Influenza pandemics.
-

Sporadic

- The word sporadic means “scattered about”. The cases occur irregularly, haphazardly from time to time, and generally infrequently. The cases are few and separated widely in time and place that they show no or little connection with each other, nor a recognizable common source of infection e.g. polio, meningococcal meningitis, tetanus....
 - However, a sporadic disease could be the starting point of an epidemic when the conditions are favorable for its spread.
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Zoonosis, epizootic and enzootic

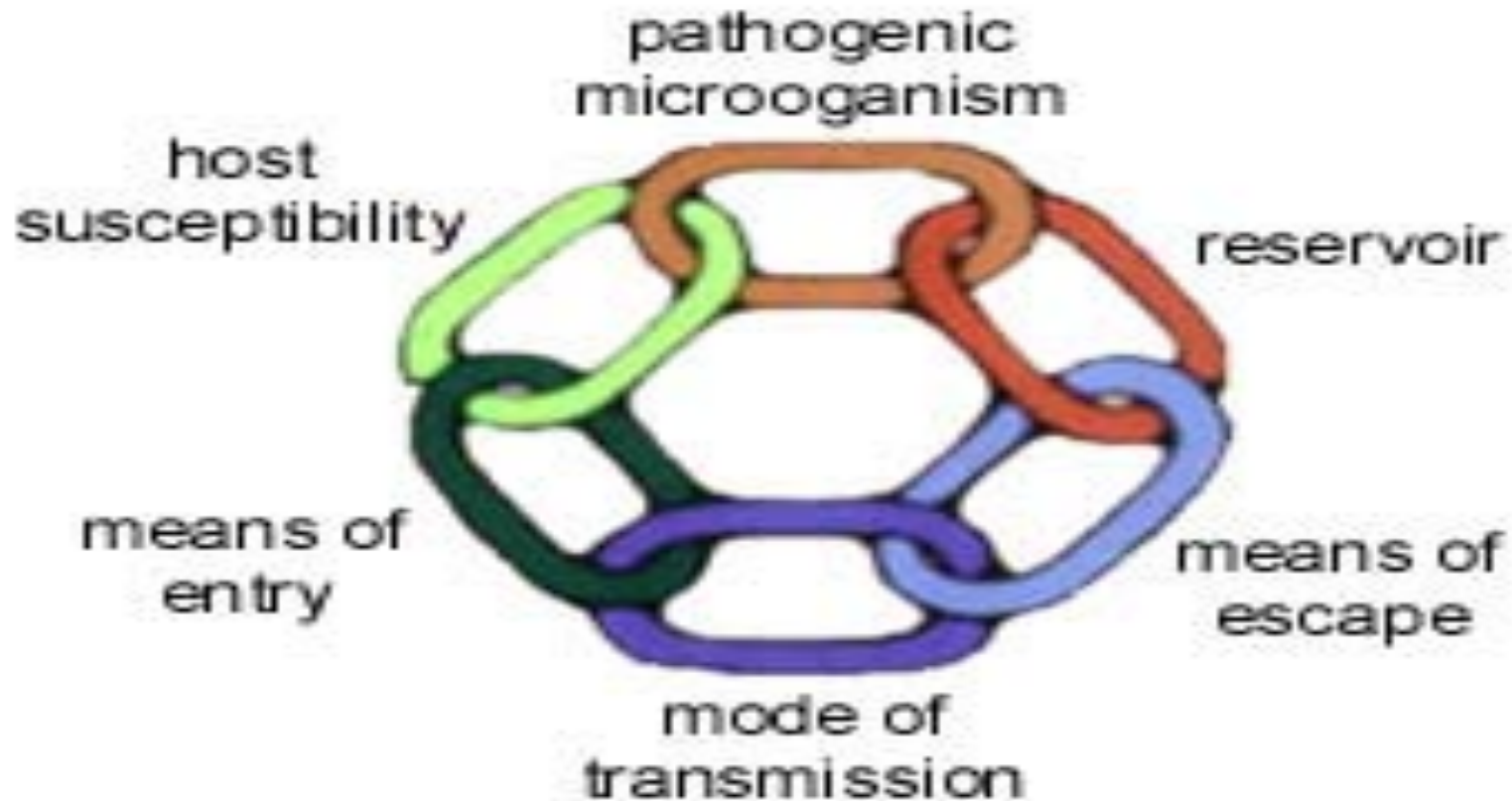
- Zoonosis is an infection that is transmissible under natural conditions from vertebrate animals to man, e.g. rabies, plague, bovine tuberculosis.....



Eradication and Elimination

- Termination of all transmission of infection by the extermination of the **infectious agent** through surveillance and containment. Eradication is an absolute process, an “all or none” phenomenon, restricted to termination of infection from the whole world.e.g small pox.
 - The term elimination is sometimes used to describe eradication of a disease from a large geographic region. Disease which are amenable to elimination in the meantime are polio, measles and diphtheria.
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CHAIN OF INFECTION



Every disease has certain weak points susceptible to attack. The basic approach in controlling disease is to identify these weak points and break the weakest links in the chain of transmission.

Concepts of Prevention and Control

Primary prevention

- Primary prevention can be defined as the action taken prior to the onset of disease, which removes the possibility that the disease will ever occur.
 - It signifies intervention in the pre-pathogenesis phase of a disease or health problem.
 - Primary prevention may be accomplished by measures of “Health promotion” and “specific protection”
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Standard Precautions—Key Steps

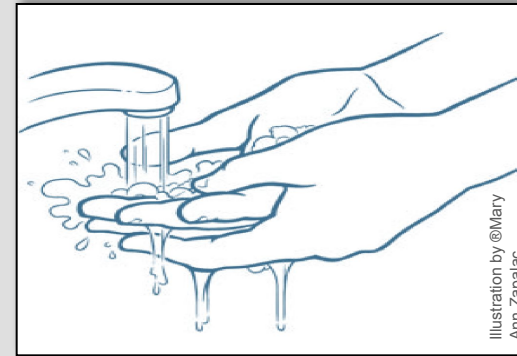
1. **Frequently wash hands or use alcohol-based handrubs.**

2. **Use gloves.**

3. **Wear an apron, mask, and eye protectors as necessary.**

4. **Properly handle and dispose of possibly infected linens and wastes.**

1. **Properly handle and dispose of sharp instruments, such as needles.**



Homecare workers need to ...

- **Avoid coming to work when they are sick.**
- **Always cover their mouths and noses when sneezing or coughing—using tissue or their upper sleeve or elbow.**
- **Always wash their hands or use alcohol handrub after coughing or sneezing.**

Control

- **Concept of control:**

The term disease control describes ongoing operations aimed at reducing:

- **The incidence of disease**
- **The duration of disease and consequently the risk of transmission**
- **The effects of infection, including both the physical and psychosocial complications**
- **The financial burden to the community.**



**THANK
YOU**