



**KHARKIV  
NATIONAL MEDICAL UNIVERSITY  
DEPARTMENT OF INFECTIOUS DISEASES**

# **Introduction to Infectious Diseases**

**Full Prof. Bondarenko A.V.**

# Girolamo Fracastoro (1478-1553)



## *De Contagione et Contagiosis Morbis (1546)*

- specific "seeds" (pathogens) – cause of endemic diseases
- main ways of transmission: direct contact, through objects and at a distance.
- epidemic diseases – infectious, i.e. capable to transfer from person to person.

## **IV REVOLUTIONS IN RELATIONSHIP OF HUMANS AND MICROORGANISMS**



**DRAMATIC DECREASING OF INFECTIOUS DISEASES MORBIDITY AND MORTALITY**

### **I. Hygiene, antiepidemic measures (XVII-XVIII C.)**

- global practice of waste removing
- development of systems of central water supply and sewerage
- introduction of personal and occupational hygiene rules

## **II. Vaccination (the end of the XVIII C.)**

**Edward Anthony Jenner  
1749-1823**



**Louis Pasteur  
1822-1895**



# III. Aseptic and antiseptic principles application (beg. of the XIX C.)

**Ignaz Philipp Semmelweis**  
**1818-1865**



**Joseph Lister**  
**1827-1912**



**Ernst von Bergmann**  
**1836-1907**



# IV. Invention and application of antimicrobials (end XIX C. – beg. XX C.)



**Paul Ehrlich**  
1854-1915

**Alexander  
Fleming**  
1881-1955

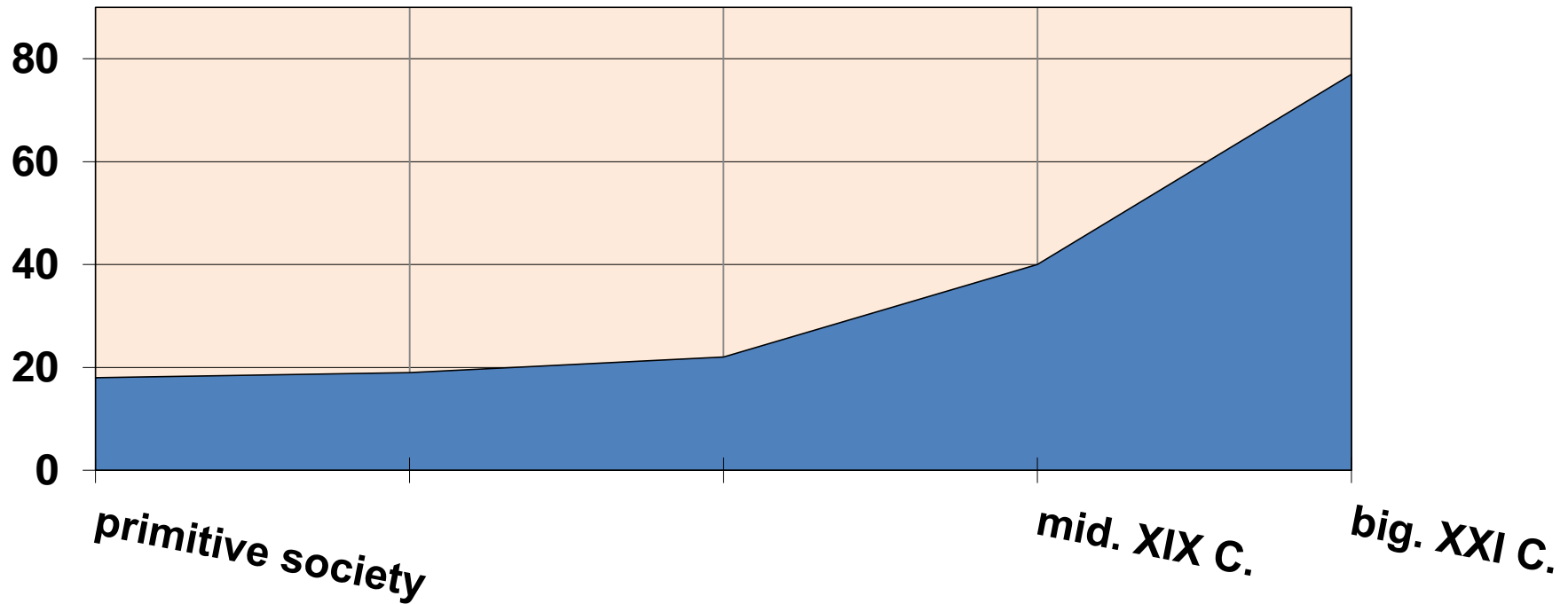


**Howard Walter  
Florey**  
1898-1968

**Ernst Boris  
Chain**  
1906-1979



Since the mid. of the XIX C. the socio-economic factors and the development of medicine have led to **increasing in the life-span** of not only individual groups of the population but for the whole of mankind.



- *The first doubling of the life-span took 4 million years.*
- *The second doubling took only 150 years.*

# The demographic losses from mumps

- susceptibility and morbidity – universal
- mortality – 0.00... %
- orchitises – 10-15 % of adolescents
- male infertility – 1 % of recovered
- on 50 million mail diseases – 500 thousand sterile men
- reduce the fertility on 300-500 thousand
- loss (in two generations) 0.5-1.0 million

# Evolution of infectious diseases

- **Liquidated:** smallpox (1980), polio (in most countries)
- **Controlled:** if vaccination is available
- **Persistent:**
  - worldwide (influenza and other respiratory inf., shigellosis and other intestinal inf., typhoid fever, rabies, etc.)
  - naturofocal (HFERS, tick-borne encephalitis, opisthorchiasis and etc.)
- **Reemerging:** diphtheria, cholera, scarlet fever, tuberculosis, malaria, leishmaniasis, syphilis

# Causes of re-emerging

1. Loss of Antibiotic Effectiveness.
2. Increased Population Density: Transmission from person to person is more likely.
3. Travel: Travelers may bring back pathogens.
4. Global Warming: May affect rainfall or other factors that currently affect diseases or their carriers.
5. Biological Warfare or Terrorist Attacks: There have recently been a number of threats of such attacks involving anthrax.
6. New Routes of transmission: Organ Transplants.
7. Complacency and Ignorance: Many, possibly most, people do not wash their hands after using the toilet.

# Emerging and newly discovered infectious diseases

- Proportion of known pathogenic viruses – 4%, of known pathogenic bacteria –12% of the total estimated number
- Helicobacter pylori, HBV and HCV, and Legionella pneumophila;
- Infections agents genuinely new to humans (ex. HIV, Borrelia burgdorferi);
- Opportunistic Infections because of immunosuppression;
- Infections that are common in one area may be introduced into a new area (ex. West Nile virus in the USA in 1999).

| <b>Date</b> | <b>Recognized Infectious Agent</b> | <b>Manifestations</b>                                 |
|-------------|------------------------------------|---|
| <b>1977</b> | <b>Ebola virus</b>                 | <b>Ebola hemorrhagic fever</b>                        |
|             | <b>Hantaan virus</b>               | <b>Hemorrhagic fever with renal syndrome</b>          |
|             | <b>Legionella pneumophila</b>      | <b>Legionnaires disease</b>                           |
|             | <b>Campylobacter jejuni</b>        | <b>Enteritis</b>                                      |
| <b>1980</b> | <b>HTLV-I</b>                      | <b>T-cell lymphoma or leukemia, myelopathy</b>        |
| <b>1981</b> | <b>Staphylococcus aureus</b>       | <b>Toxic shock syndrome</b>                           |
| <b>1982</b> | <b>Escherichia coli O157:H7</b>    | <b>Hemorrhagic colitis, hemolytic-uremic syndrome</b> |
|             | <b>Borrelia burgdorferi</b>        | <b>Lyme disease</b>                                   |
| <b>1983</b> | <b>HIV</b>                         | <b>AIDS</b>   |
|             | <b>Helicobacter pylori</b>         | <b>Gastric ulcers</b>                                 |
| <b>1988</b> | <b>HEV</b>                         | <b>Hepatitis E</b>                                    |
| <b>1989</b> | <b>HCV</b>                         | <b>Hepatitis C</b>                                    |
| <b>1992</b> | <b>Vibrio cholerae O139</b>        | <b>New epidemic cholera strain</b>                    |
|             | <b>Bartonella henselae</b>         | <b>Cat-scratch disease</b>                            |
| <b>1995</b> | <b>KSHV (HHV-8)</b>                | <b>Kaposi sarcoma</b>                                 |
| <b>1999</b> | <b>West Nile virus</b>             | <b>West Nile fever, neuroinvasive disease</b>         |
| <b>2003</b> | <b>SARS coronavirus</b>            | <b>Severe acute respiratory syndrome</b>              |

# Slow infectious disease

- Usually long incubatory period (for e.g. about one year for rabies, 40 years for T-cellular leukemia of human).
- Slowly progressing character of the process.
- Original defeat of organs and tissues (not inflammation) and primary degenerate character (prions disease)
- 100% lethal outcome.

# World Disasters Report

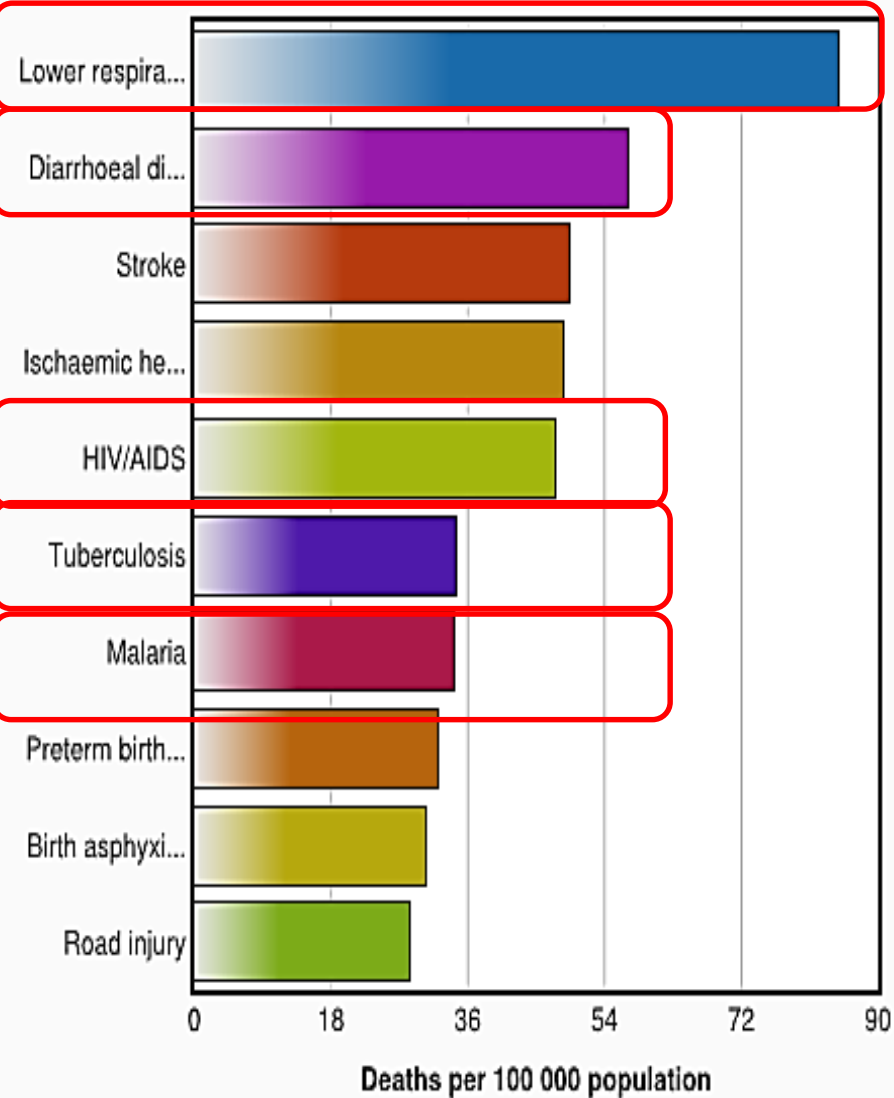
Focus on public health



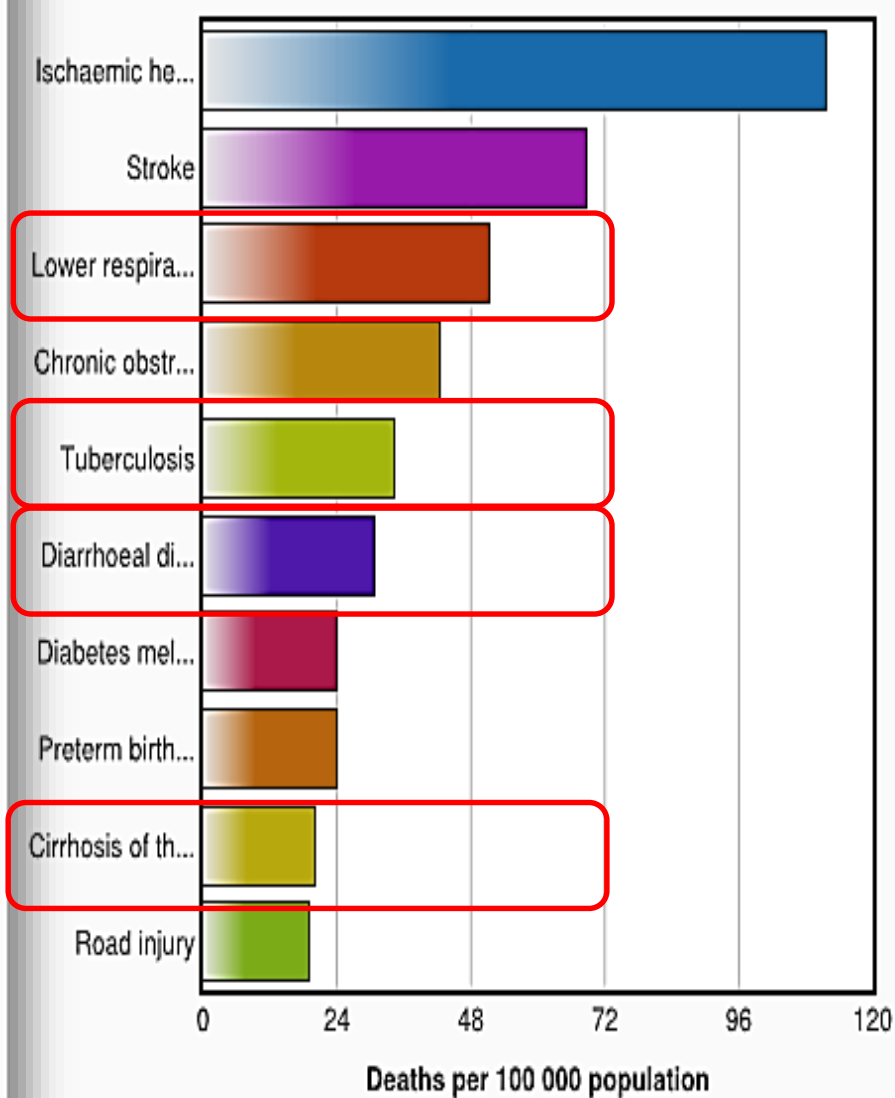
International Federation  
of Red Cross and Red Crescent Societies

- *Every day, over 15,000 people are infected with HIV/AIDS – half of them under 25 years old.*
- *Over 40 per cent of the world lives in malaria-prone areas.*
- *An estimated 150 million people have died from AIDS, tuberculosis (TB) and malaria since 1945, compared to 23 million from war between 1945 and 1993.*

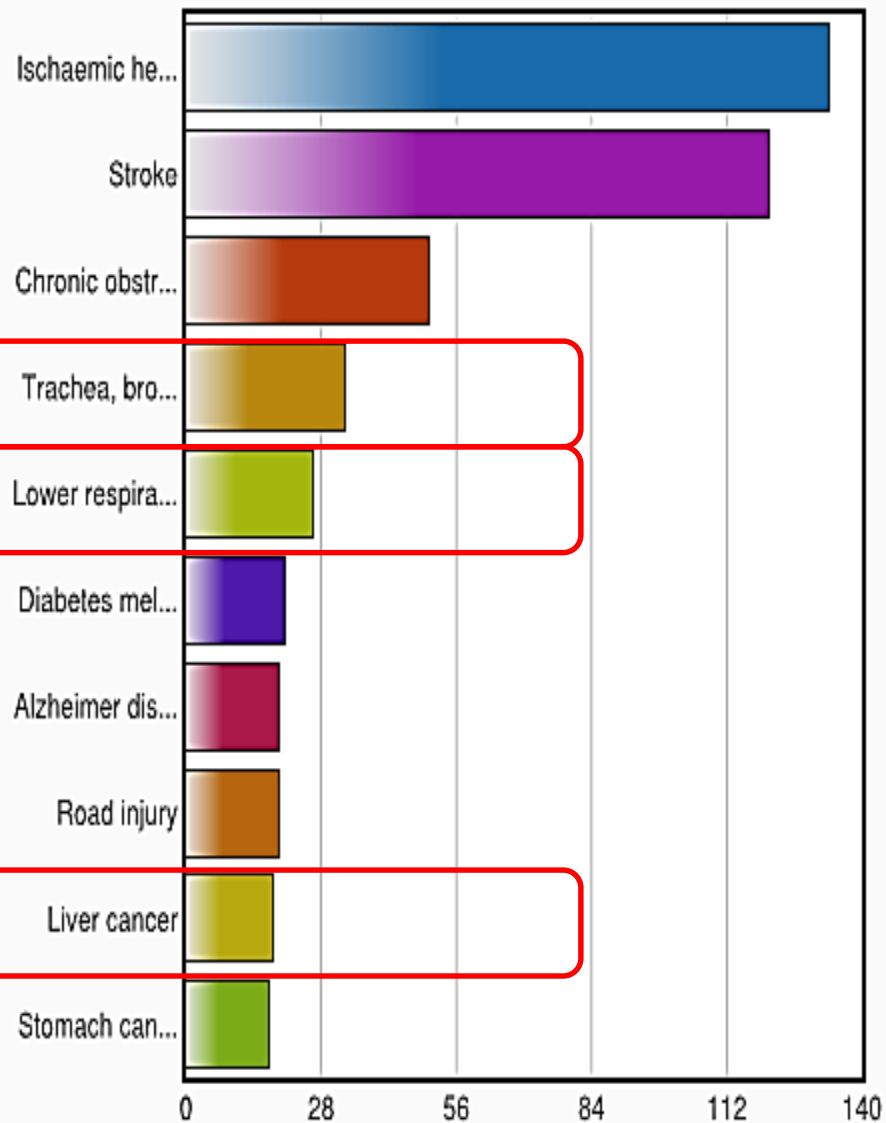
The top 10 causes of death in low-income economies 2015



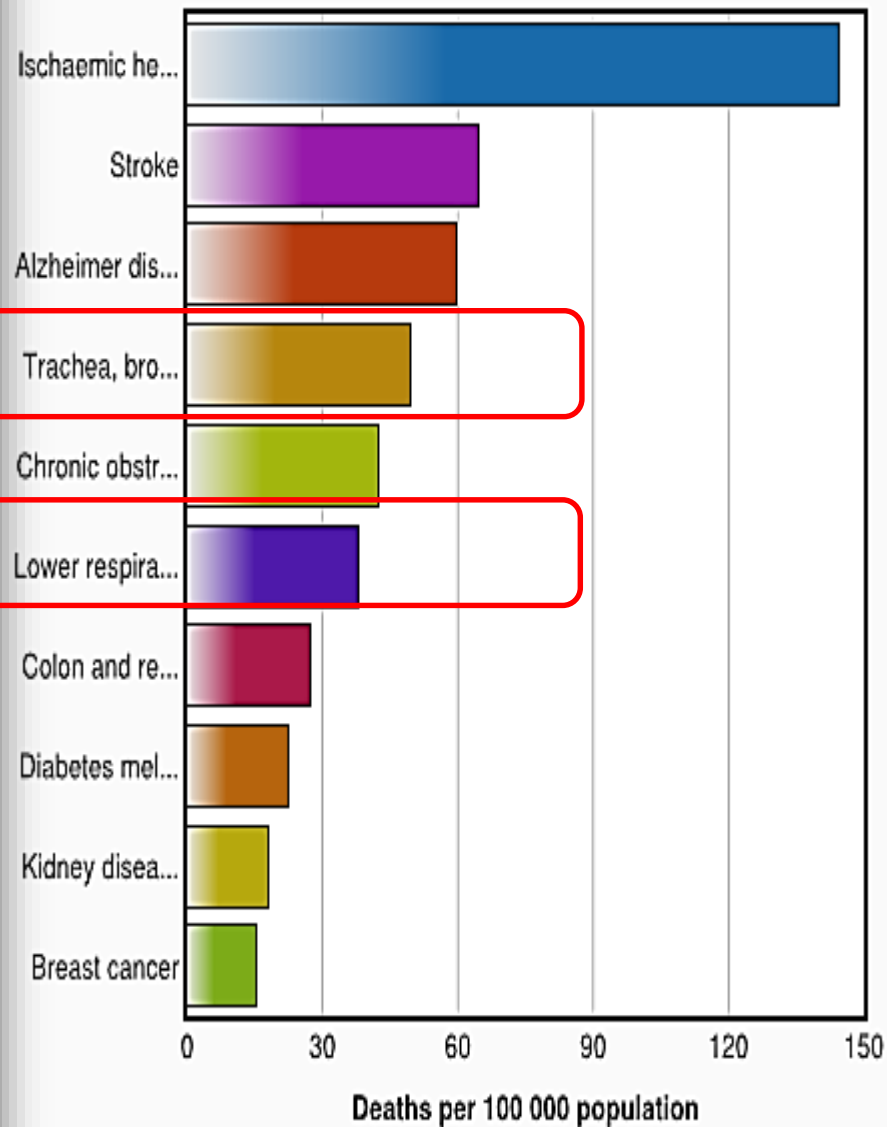
The top 10 causes of death in lower-middle-income economies 2015



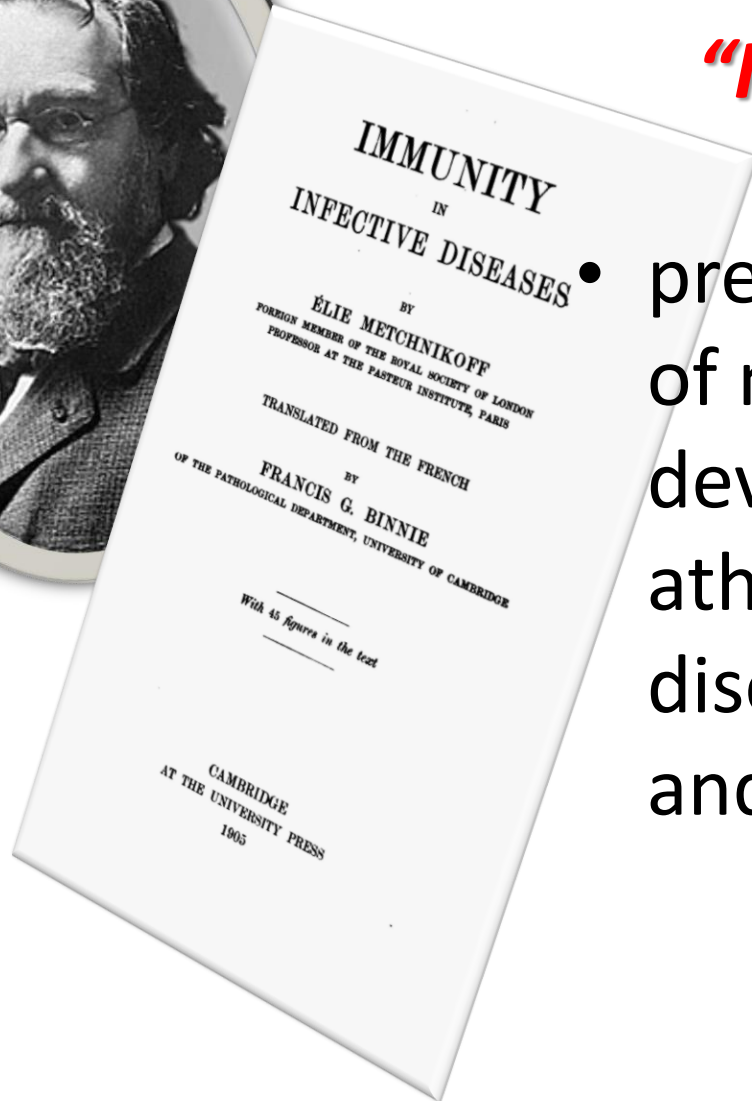
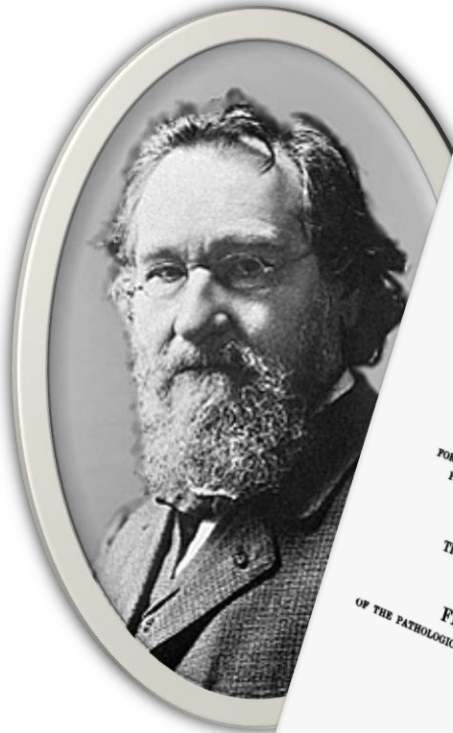
The top 10 causes of death in upper-middle-income economies 2015



The top 10 causes of death in high-income economies 2015



# I.I. Mechnikov (1845–1916)



## *“Immunity in infectious diseases” (1901)*

- predicted the involvement of microorganisms in the development of atherosclerosis, heart diseases, diabetes mellitus and malignant neoplasms.

# The proportion of infectious agents in the aetiology of cancer (WHO)

| <b>Localization</b> | <b>Proportion</b> |
|---------------------|-------------------|
| Stomach             | 55 %              |
| Cervix uteri        | 83 %              |
| Liver               | 82 %              |
| Lymphomas           | 16 %              |
| Burkitt's lymphoma  | 84 %              |

**Nobel laureates in physiology for their pioneering work on *Helicobacter pylori* and its role in gastritis and peptic ulcer disease**

**Robin Warren  
1937**



**Barry Marshall  
1951**



# Malignant neoplasms

| Absolutely play a certain role in pathogenicity   | Associated with the development of pathology  |
|---|---|
| <p><b>H. pylori</b> (cancer of the stomach and duodenum);</p> <p><b>HBV and HCV</b> (carcinoma);</p> <p><b>papillomaviruses</b> (cervical cancer);</p> <p><b>EBV</b> (nosopharyngeal carcinoma, lymphoma);</p> <p><b>HHV-8 and HIV</b> (Kaposi's sarcoma);</p> <p><b>HTLV</b> (leukemia, lymphoma);</p> <p><b>Schistosoma haematonium</b> (bladder cancer);</p> <p><b>Schistosoma japonicum</b> (cancer of the liver and rectum);</p> <p><b>CMV</b> (through immunosuppression)</p> | <p><b>HCV</b> (non-Hodgkin's lymphoma, thyroid cancer);</p> <p><b>papillomaviruses</b> (ano-genital cancer and bladder cancer);</p> <p><b>HSV type 2</b> (bladder cancer);</p> <p><b>Salmonella typhi</b> (hepatobiliary cancer);</p> <p><b>Chlamydophila pneumoniae</b> (lung cancer);</p> <p><b>Chlamydia trachomatis</b> (squamous cell carcinoma of the cervix uteri);</p> <p><b>Chlamydia psittaci and C. jejuni</b> (lymphomas);</p> <p><b>Mycoplasma sp.</b> (tumors of different localization);</p> <p><b>Propionibacterium acnes</b> (prostate cancer)</p> |

# Annual (estimated) number of oncological diseases in the world, developed as a consequence of chronic infections

| Pathogen             | Disease  | N of Cases |
|----------------------|--|------------|
| EBV                  | Burkitt's lymphoma,<br>nasopharyngeal cancer                         | 100 000    |
| HBV                  | Hepatocellular carcinoma   | 280 000    |
| HCV                  | Hepatocellular carcinoma   | 110 000    |
| Human papillomavirus | Cervical cancer  | 550 000    |
| HHV-8                | Kaposi's sarcoma,<br>primary diffuse sarcoma,<br>Castleman's disease | 55 000     |

# Role of microorganisms in the heart diseases

| <b>Absolutely play a certain role in pathogenicity</b>                                      | <b>Associated with the development of pathology</b>   |
|---|---|
| <p><i>Chlamydia pneumoniae</i>,<br/>HSV, CMV, HCV,<br/>periodontium<br/>infections etc.</p> | <p><i>Helicobacter pylori</i>,<br/><i>Mycobacterium tuberculosis</i>, ECHO &amp;<br/>Coxsackie B,<br/>HAV, Influenza virus,<br/>mumps virus,<br/><i>Nanobacterium sanguineum</i> etc.</p> |

# Role of microorganisms in the cerebrovascular diseases

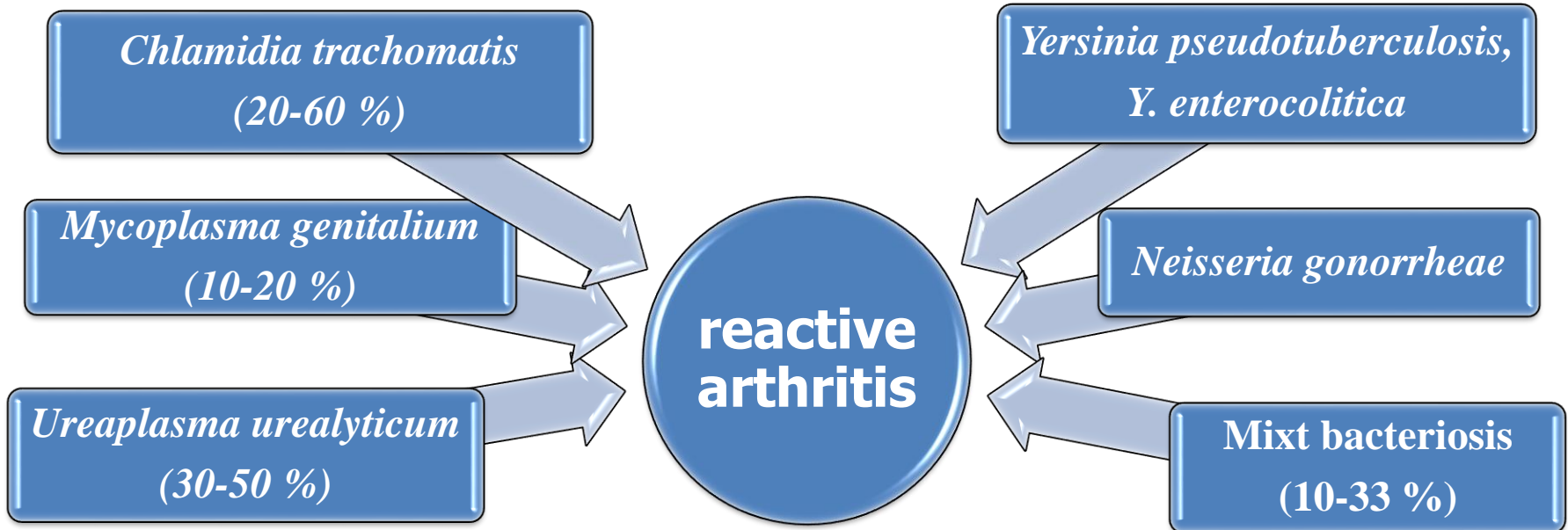
| <b>Absolutely play a certain role in pathogenicity</b>                      | <b>Associated with the development of pathology</b>   |
|---|---|
| <p><i>Nanobacterium sanguineum</i> (through pathological calcification)</p> | <p><i>C. pneumoniae</i>,<br/>herpetic viruses,<br/><i>Mycobacterium tuberculosis</i>, ECHO &amp;<br/>Coxsackie B, HAV, Influenza virus, mumps virus</p> |

# Absolutely play a certain role in pathogenicity

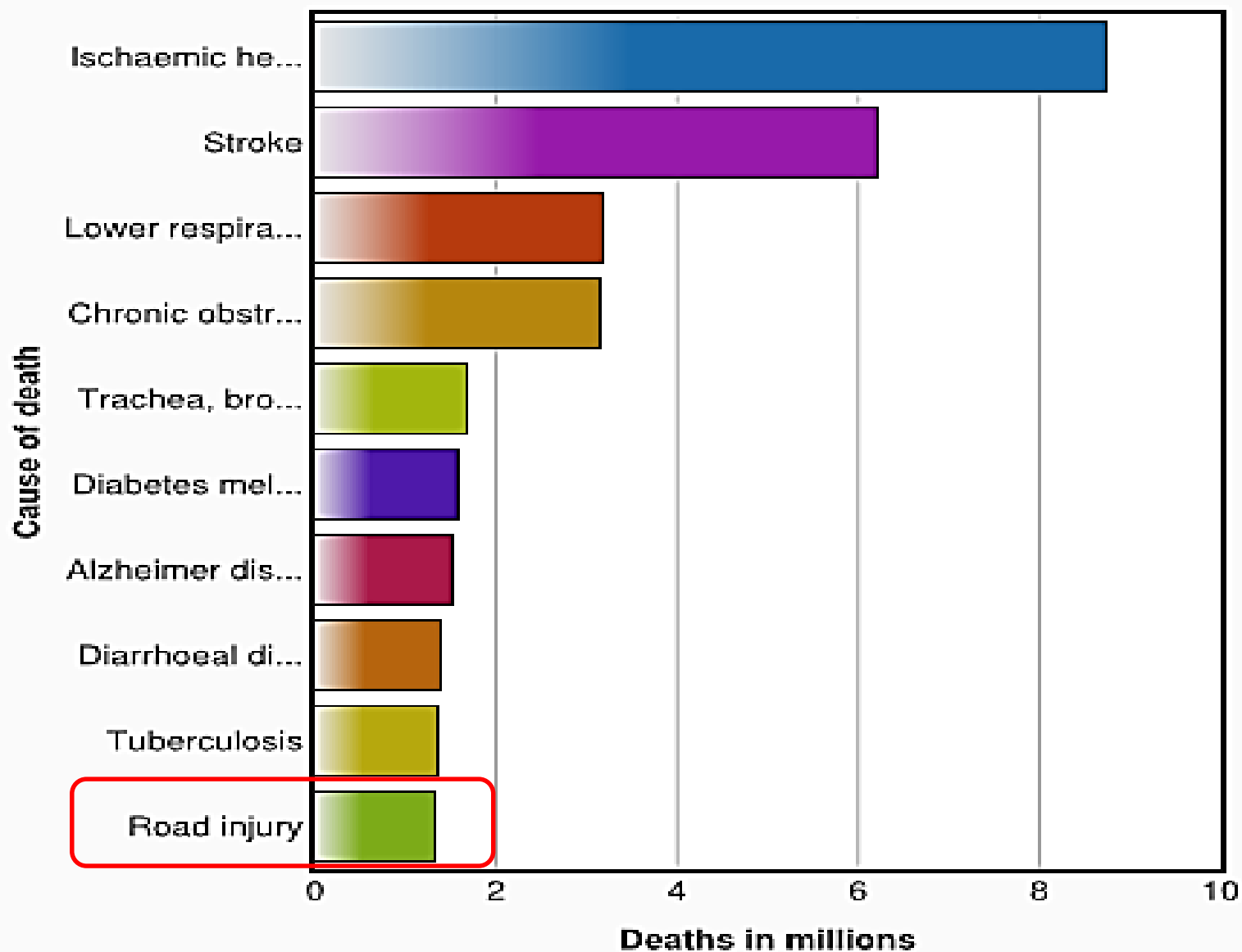
|                            |  |
|----------------------------|--|
| <b>Diabetes mellitus</b>   | <b>I type:</b> rubella virus, CMV, Coxsackie B, mumps virus, adenovirus, EBV, rotavirus, reovirus<br><b>II type:</b> HCV, <i>H. pylori</i> |
| <b>Alzheimer's disease</b> | <i>Chlamydia pneumoniae</i> , herpetic viruses, Influenza virus  |

# RHEUMATOLOGY ILLNESSES

|   |                             |
|---|-----------------------------|
| <b>Group A Beta-Hemolytic Streptococcus</b> | <b>rheumatism</b>           |
| <b>EBV</b>                                  | <b>rheumatoid arthritis</b> |
| <b>gonococcus, brucella and others.</b>     | <b>specific arthritis</b>   |



## Top 10 causes of death globally 2015

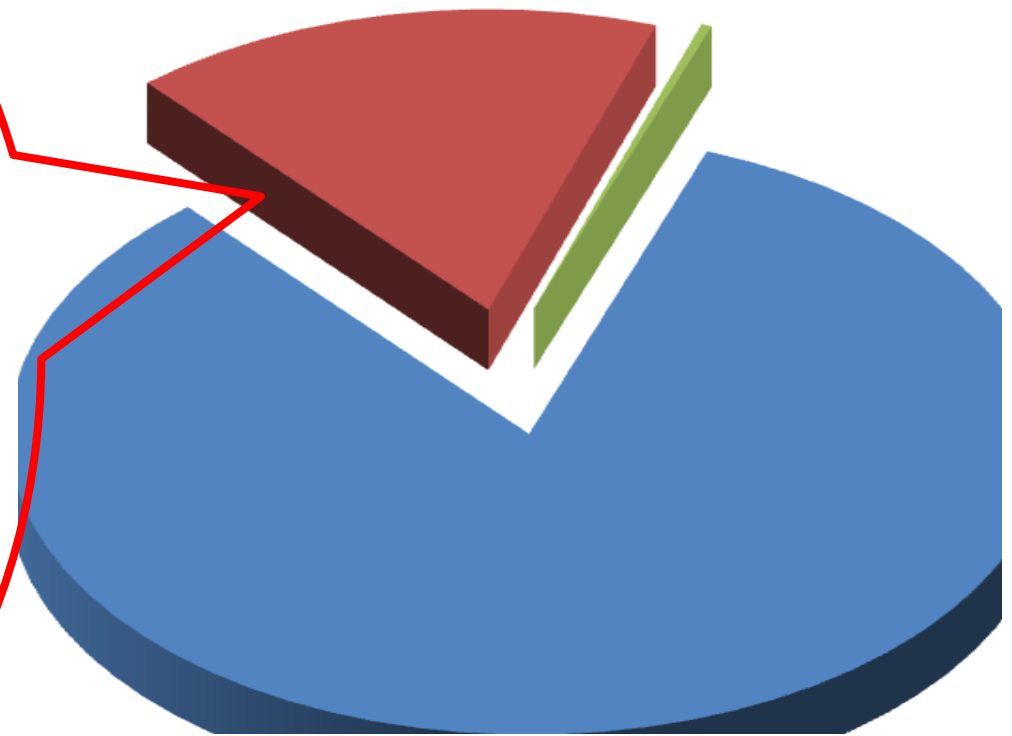


# DISTRIBUTION OF INFECTIOUS DISEASES BY THE BASIC GROUPS OF INFECTIONS

**Chronic**

**«Classic»**

The chronic process provides both a longer survival of the microorganism and a longer life of the host as a source of infection.



**Acute respiratory and intestinal**

# Major infectious risks for healthcare workers

- **Bloodborne pathogens**
  - Via percutaneous or mucosal exposure
  - Major risks: **HBV, HCV, HIV**
- **Airborne or droplet transmitted diseases**
  - Varicella, measles, pertussis, meningococcal infection, influenza, other respiratory viruses (e.g., RSV, SARS)
- **Contact transmitted diseases (direct, indirect)**
  - *C. difficile*, MRSA, herpes simplex, adenovirus (keratoconjunctivitis)

# Bloodborne pathogens transmitted by needlesticks

## Big 3

- Hepatitis B virus
- Hepatitis C virus
- HIV

## Others

- Argentinian HF virus
- Blastomycosis
- Brucella spp.
- Corynebacterium diphtheria
- Cryptococcosis
- Dengue
- Ebola virus
- Herpes simplex virus
- Leptospira spp.
- Marburg virus
- Mycobacterium marinum
- Mycobacterium tuberculosis
- Mycoplasma caviae
- Plasmodium spp.
- Rickettsia rickettsii
- Toxoplasma gondii
- Treponema pallidum
- Varicella zoster virus
- West Nile virus

# Recommended vaccines for HCWs

- Hepatitis B
- Influenza
- Measles
- Mumps
- Rubella
- Varicella
- Tetanus
- Diphtheria
- Pertussis
- Meningococcus



# Post-exposure prophylaxis

- Animal bite wound
- Avian influenza
- Anthrax
- Hepatitis A
- Hepatitis B
- HIV occupational exposure
- Influenza A
- Influenza B
- Measles
- Rabies
- Human bite wound
- Invasive *H. influenzae*
- Meningococcal infection
- Pertussis
- Smallpox
- Syphilis
- Tuberculosis
- Varicella-zoster
- **Not available**
  - **Mumps**
  - **MERS**
  - **Parvovirus B19**
  - **Hepatitis C**

# Revue

- the role of infectious pathology has not decreased, but has increased dramatically;
- the importance of "classic" infectious diseases, which in the past caused epidemics and pandemics, decreased;
- the microbial component of diseases is not eradicated: prevalent diseases have infectious roots;
- chronic (often lifelong) viral infections have spread widely, and become socially significant diseases;
- the threat of activation of the epidemic process of many infections remains.

# Infection (n.)

late 14c., "infectious disease; contaminated condition;" from Old French *infeccion* "contamination, poisoning" (13c.) and directly from Late Latin *infectionem* (nominative *infectio*) "infection, contagion", noun of action from past participle stem of Latin *inficere* "to spoil, to stain".

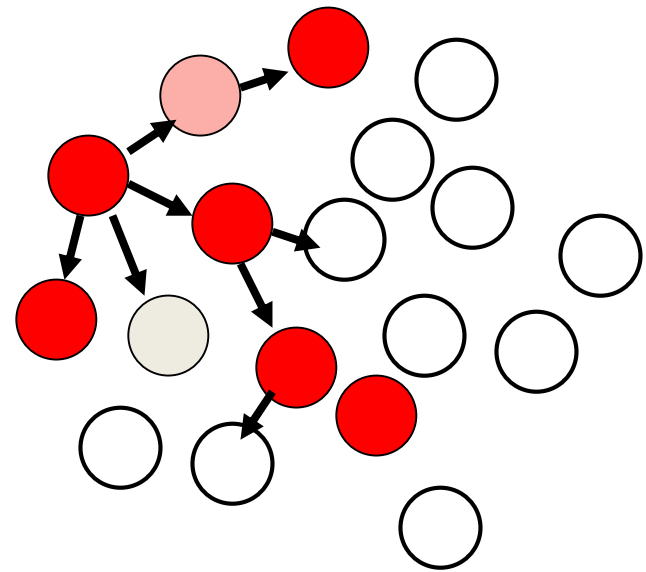
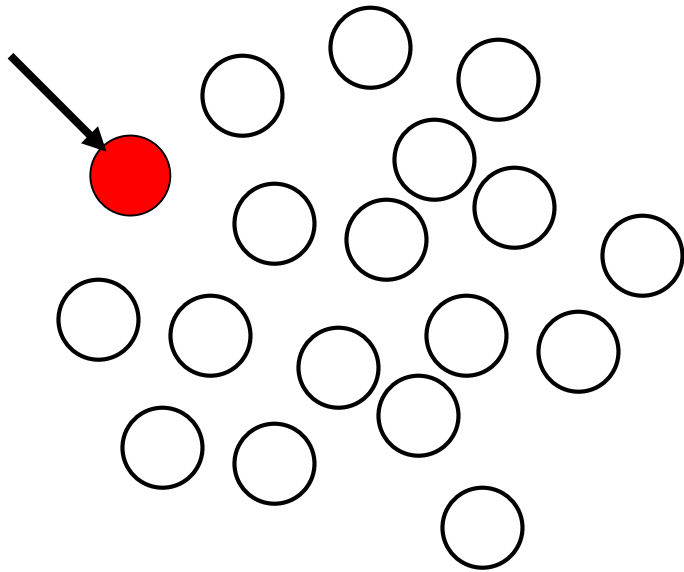
Meaning "communication of disease by agency of air or water" (distinguished from *contagion*, which is body-to-body communication), is from 1540s.

**An extensive group of diseases caused by alive microorganisms (prions, viruses, bacteria, fungi and protozoa) that can be transmitted from the infected organism to another and may have epidemic spreading.**

# Infection

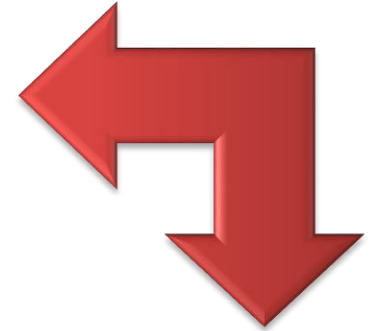
**A case is a risk factor ...**

❖ **Infection in one person can be transmitted to others**

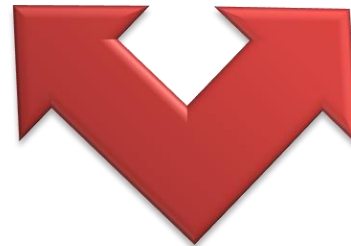


# THE RING OF THE PATHOLOGICAL PROCESS

**PATHOGENIC FACTORS:**  
biological  
(causative agents),  
chemical, physical,  
psychic ...

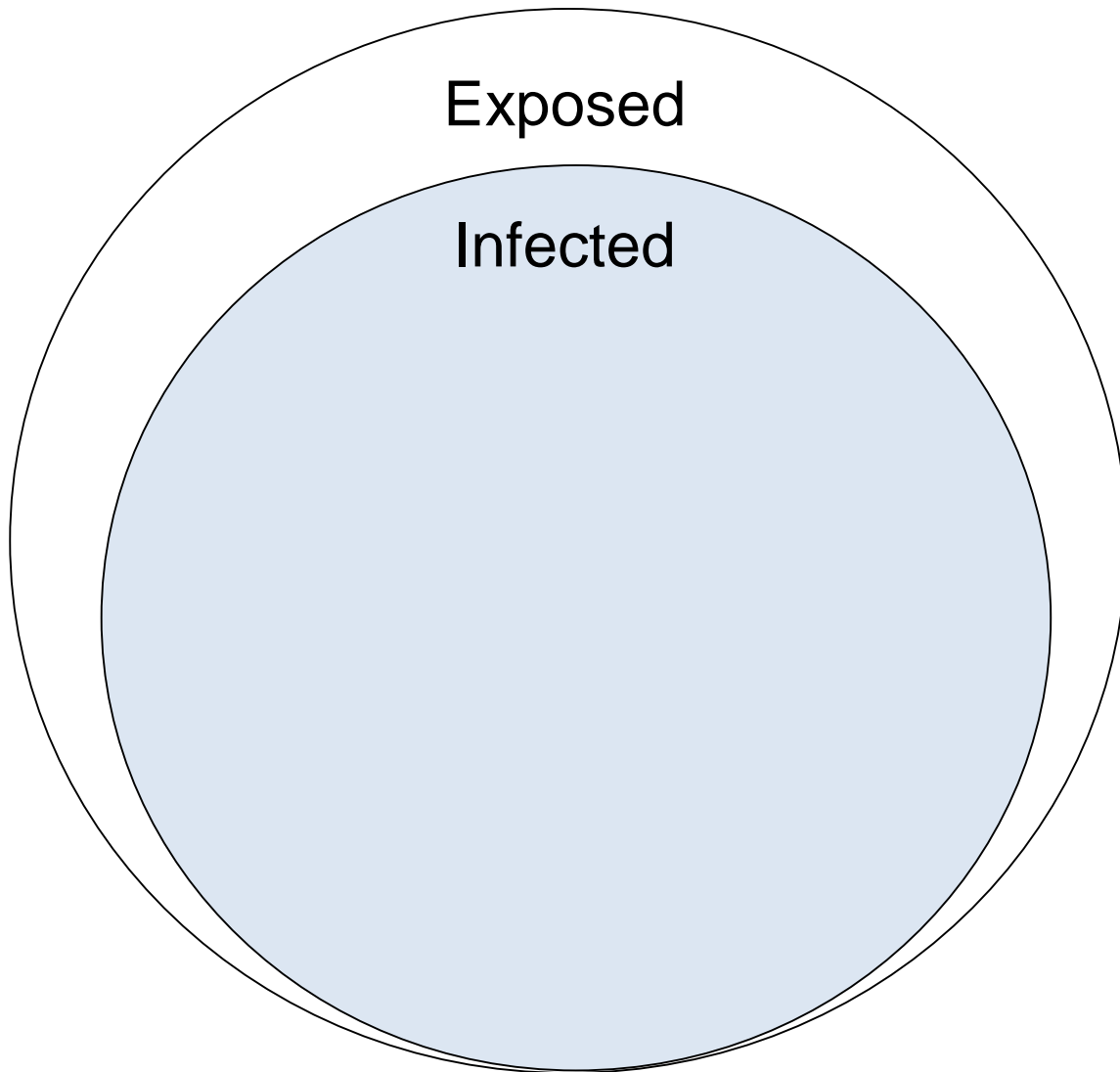


**ENVIRONMENTAL FACTORS:**  
cosmic influences,  
climate, water, food,  
production, living  
conditions ...



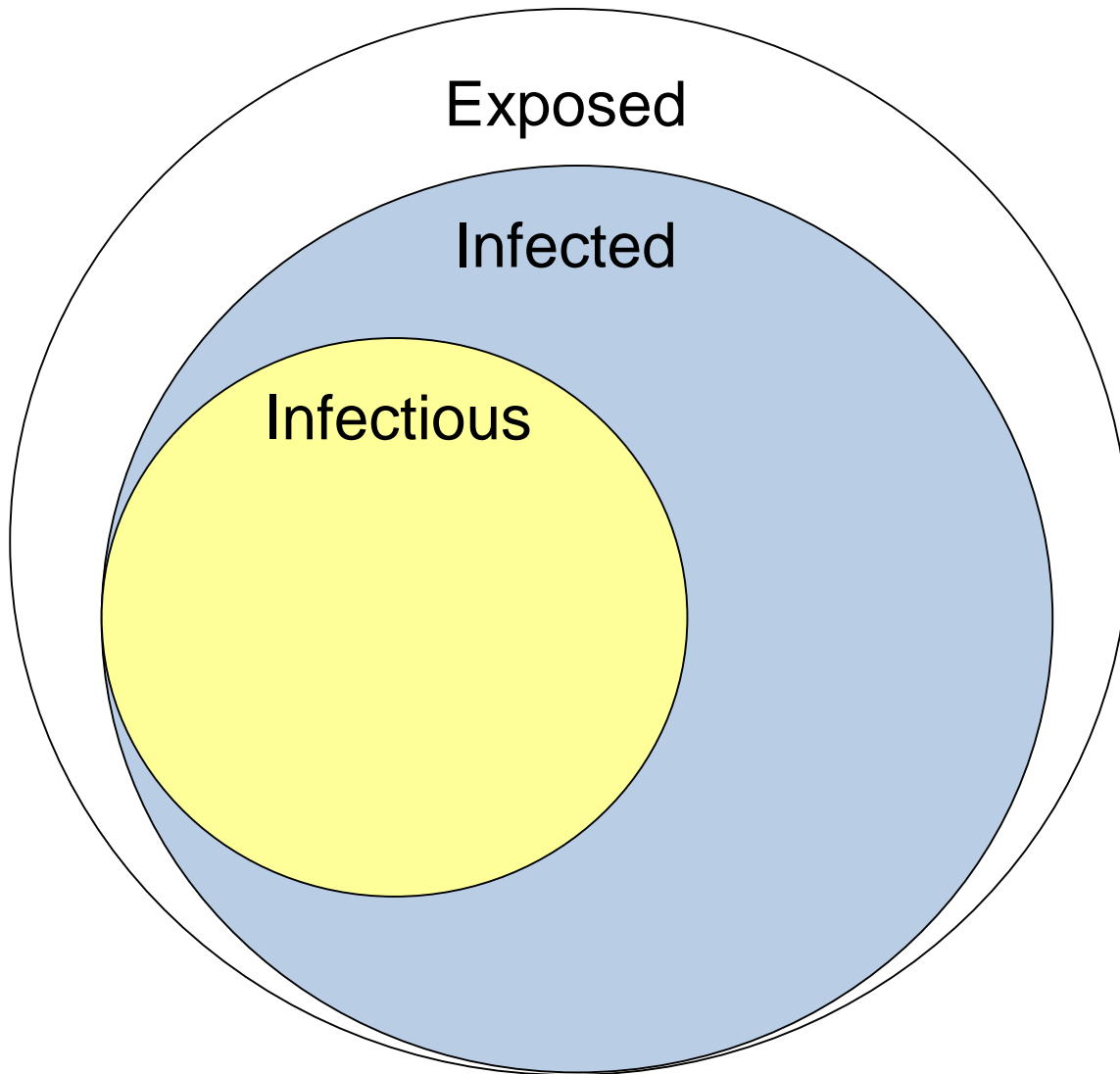
**HOST FACTORS:**  
age, gender, race,  
heredity,  
lifestyle,  
bad habits,  
profession,  
transferred  
diseases ...

# Terminology



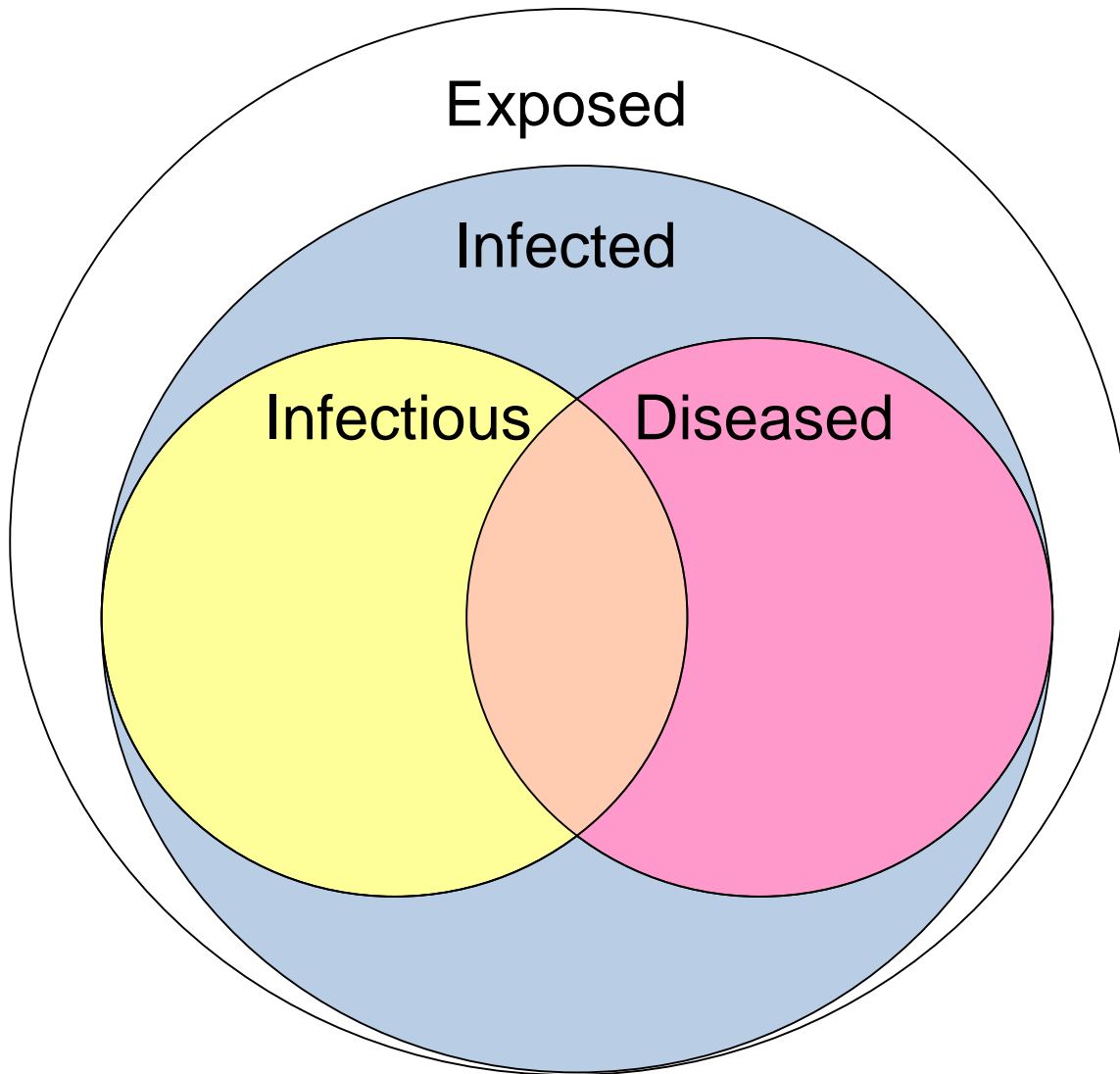
Infection - a  
parasitic  
organism enters  
a host

# Terminology



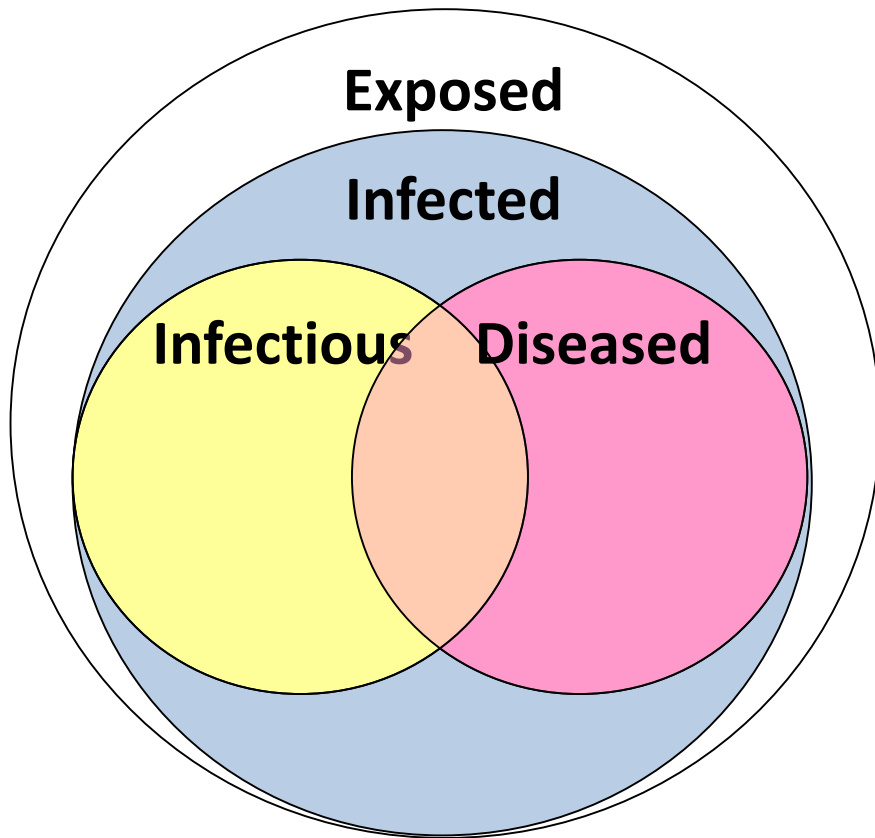
Transmission - a parasitic organism replicates within an infected host, and the infected host sheds infectious individuals (the host is said to be “infectious” or “transmitting”)

# Terminology



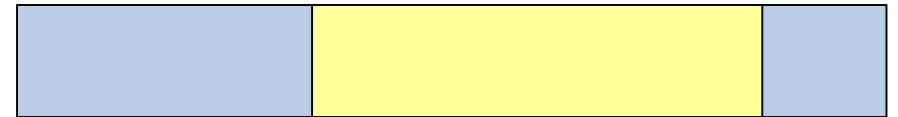
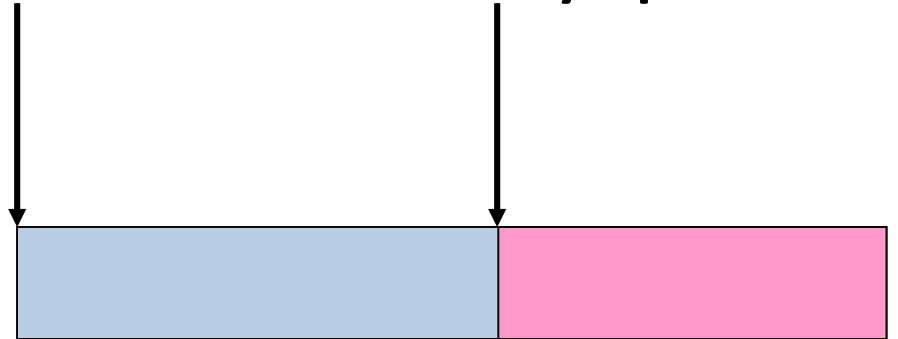
Pathogenesis - a parasitic organism causes changes in the physiology of an infected host, affecting survival and/or reproduction (the host is said to be “diseased”)

# Terminology



Infection

Onset of symptoms



Onset of shedding

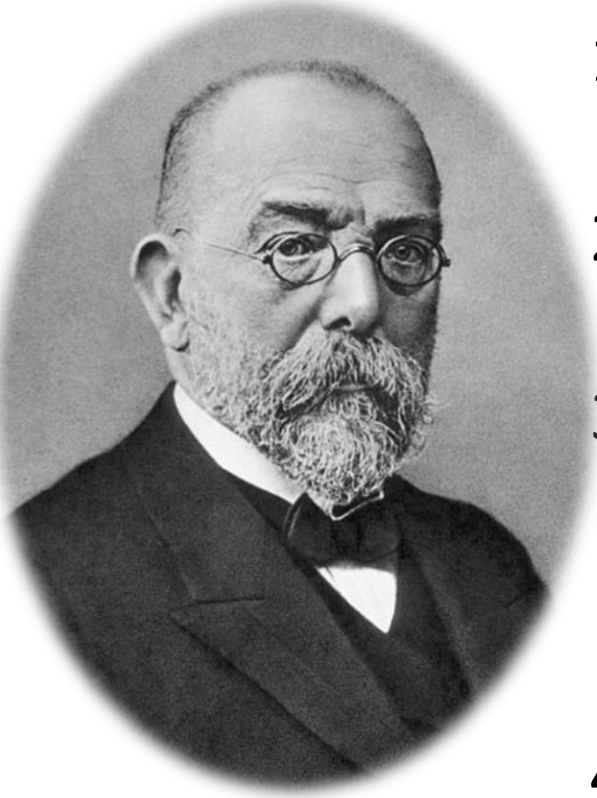
# Terminology

- **INFECTIOUS PROCESS** - limited in time complex of reciprocal adaptive reactions of **MICROORGANISM** (parasite) and **MACROORGANISM** (host), aimed at restoring the disturbed homeostasis, taking place in certain conditions of the **ENVIRONMENT**.
- **INFECTIOUS DISEASE** - the extreme degree of development of the infectious process, reflecting the degree of its development and having characteristic nosological signs (clinical, morphological, functional and immunological).

# Terminology

- **COMMENSALISM** - condition with presence of microorganism in organism of host without damage but with activation of systems of specific and nonspecific resistance.
- **SYMBIOSIS** - condition of gaining of adaptive advantages of microorganism and host organism.

# Koch's Postulates



Heinrich Hermann  
Robert Koch  
1843-1910

1. The same pathogen must be present in every case of the disease;
2. The pathogen must be isolated from the diseased host and grown in pure culture;
3. The pathogen from the pure culture must cause the disease when it is introduced into a healthy but susceptible organism.
4. The pathogen must be isolated from the inoculated animal and be shown to be the original organism.

# Modifications to Koch's Postulates

1. Some infectious agents cannot be cultured  
e.g. prions
2. Some pathogens have non-virulent strains whose presence does not link them to a disease. E.g. non encapsulated *Diplococcus pneumoniae*

# The Role of Pathogens in the Infection Process

- (1) **Invasiveness:** adhesion, penetration ability.
- (2) **Virulence:** toxins, enzymes, and histolytic ability.
- (3) **Infection dose:** minimal dose that can cause an infection.
- (4) **Variability:** change in structure of the pathogen to evade from host immunity.

# Pathogenesis

## Sequence of activities

1. Transmission of causative agent to susceptible host;
2. Adherence of the agent to a target tissue;
3. Colonization and invasion;
4. Damage to host by toxins or other mechanisms;
5. Exit from host;
6. Survival outside host long enough for step 1 to occur.

# How microorganisms cause disease

1. Contact or enter host cells and directly cause cell death.
2. Release endotoxins or exotoxins that kill cells.
3. Induce host cellular responses that are directed against invader but cause additional host damage such as scarring and hypersensitivity reactions.

# Terminology

- **EXOGENOUS INFECTIONS** - infections that occur when penetrating the pathogen from the outside.
- **ENDOGENOUS (AUTOINFECTION)** - infection caused by its own conditionally pathogenic flora, due to a decrease in the body's defenses caused by the adverse effects of environmental factors.
- **OPPORTUNISTIC INFECTIONS** - arise in special conditions favorable for their development. These diseases are caused mainly by the opportunistic flora in the presence of various immunity disorders (primary and secondary immunodeficiencies).

# Sources of infection

- **Patients:** acute, chronic; typical, atypical (mild, moderate, severe)
- **Subclinical infection:** no symptoms (ex. poliomyelitis)
- **Carriers:** chronic (ex. typhoid, shigellosis)
- **Infected animals:** (ex. rabies, plague)
- **Environment:** (ex. botulism)

# **Epidemiological Data**

**(1) History of contact with similar cases.**

**(2) Occupation, living environment and life style.**

**(3) History of vaccination.**

**(4) History of transfusion of blood or blood products.**

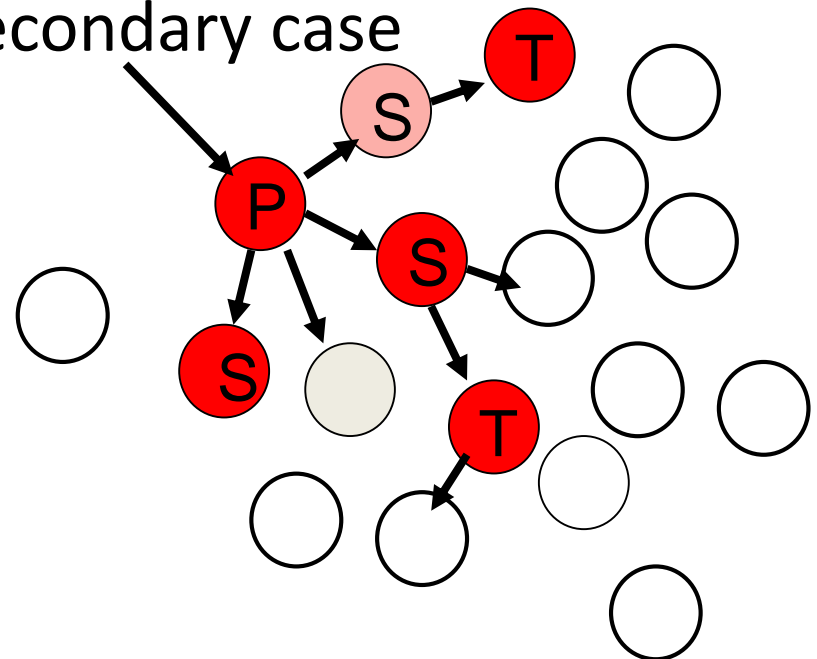
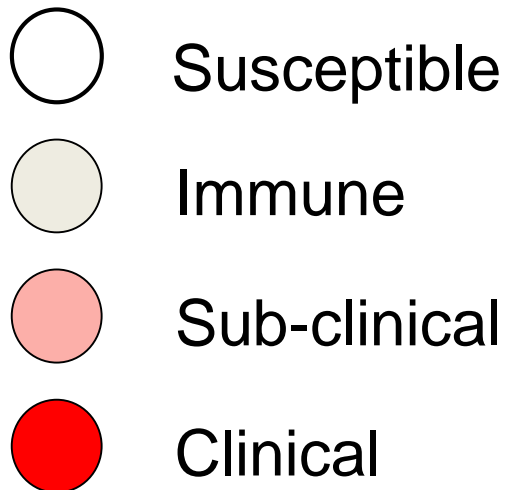
# Routes of Transmission

|                      |  |
|----------------------|--|
| <b>Contact</b>       | <b>Requires direct or indirect contact (fomites, blood, or body fluid)</b>                       |
| <b>Food or Water</b> | <b>Ingestion of contaminated food or water</b>   |
| <b>Airborne</b>      | <b>Inhalation of contaminated air</b>  |
| <b>Vector-borne</b>  | <b>Dependent on biology of vector as well as infectivity of organism</b>                         |
| <b>Perinatal</b>     | <b>Similar to contact infection, however, the contact may occur in utero or during delivery.</b> |
| <b>Sexual</b>        | <b>Transmission by sexual intercourse.</b>   |

# Transmission

## Cases

- Index – the first case identified
- Primary – the case that brings the infection into a population
- Secondary – infected by a primary case
- Tertiary – infected by a secondary case



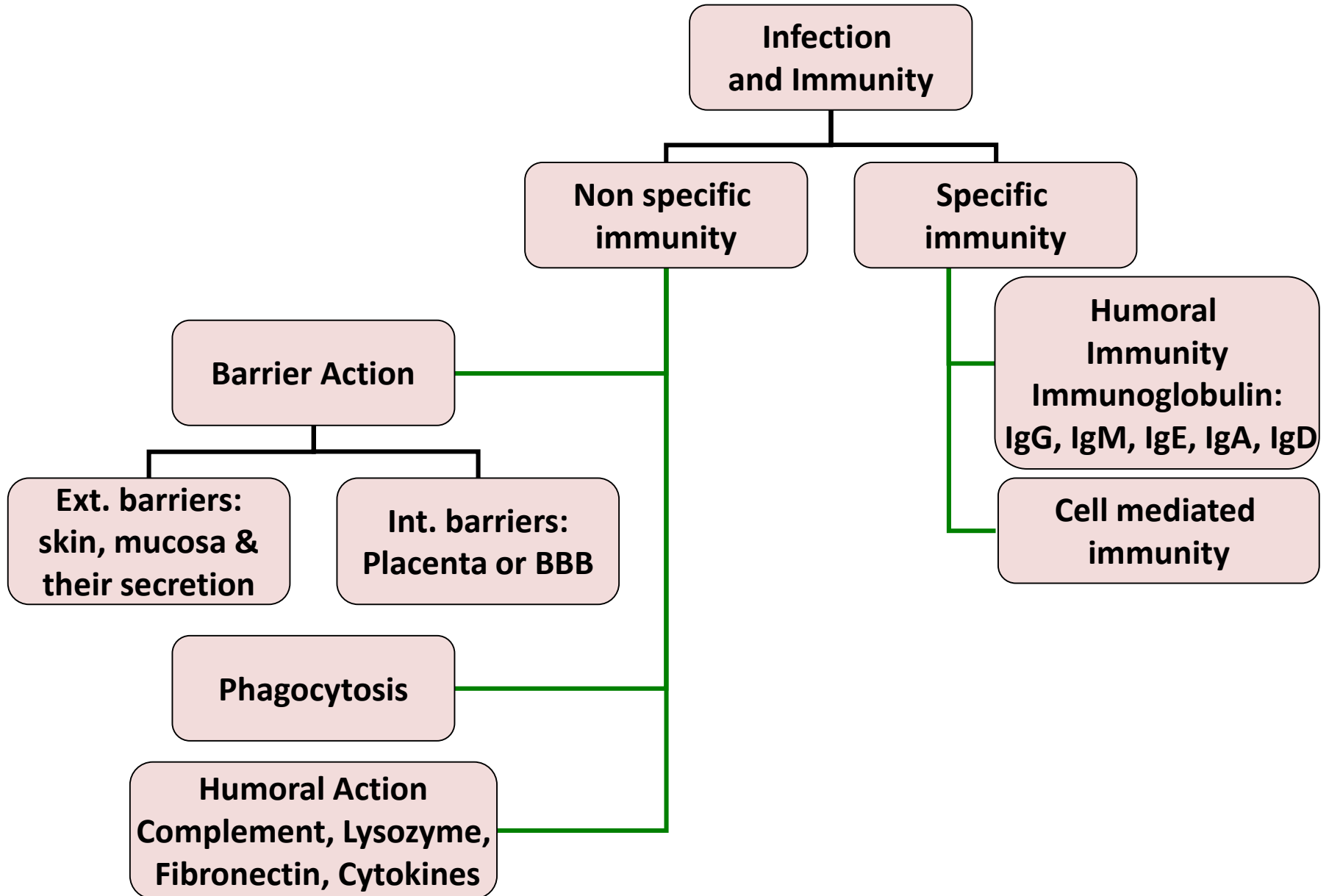
# CLASSIFICATION

| Mechanism, factors                                 | Groups of infections | Human   | Animals  | Environment                                |
|--|----------------------|---|--|--|
| <b>Alimentary</b><br>-water<br>-food               | Intestinal           | Typhoid, paratyphoid A, shigellosis, cholera, polio | Paratyphoid B, salmonellosis, brucellosis, other | Botulism, listeriosis, clostridiosis, etc. |
| <b>Air-droplet</b>                                 | Respiratory tract    | Diphtheria, influenza, measles, etc.                | Ornithosis, etc.                                 | Aspergillosis, mucormycosis, etc.          |
| <b>Transmissible</b><br>(flies, fleas, lice, etc.) | Blood                | Louse-borne typhus, malaria, viral hepatitis B,C    | Plague, tularemia, tick-borne encephalitis, etc. | Hospital infections                        |
| <b>Contact</b><br>-direct;<br>-indirect            | Skin                 | Gonorrhoea, trachoma, etc.                          | Anthrax, hydrophobia                             | Tetanus, dermatomycosis                    |
| <b>Vertical</b>                                    | Innate               | measles, syphilis, other                            | Toxoplasmosis, listeriosis                       |  |

# Phases of infectious process

- Implantation of pathogen through mucus or skin in local lymphonodules.
- Penetration of agent into bloodstream.
- Penetration of microorganism in reticuloendothelial system.
- Generalization of process.
- Excretion of agent and toxins.
- Development of phase immune response – creation of stable (or not) immunity.
- Convalescence.
- Latent form (persistent form) e.g. herpes simplex, CMV, HIV.

# Immune reaction of host



# IMMUNE RESPONSE SYSTEM

- I. **NATURAL FACTORS (nonspecific) 4-5 hrs**  
Cellular: macrophages, neutrophils, NK-cells;  
Humoral: IgG (natural), compliment etc.
- II. **EARLY INDUCTABLE ANSWER, 96 hrs**  
Cellular: NK-cells, macrophages, neutrophils;  
Humoral: IL, CSF, TNF.
- III. **SPECIFIC ADAPTIVE ANSWER**  
Cellular: lymphocytes, macrophages;  
Humoral: specific antibodies IgM, IgG, cytokines.  
Major histocompatibility complex – HLA;  
Th1 – cellular:  $\gamma$ -INF, NK, CD8;  
Th2 – humoral: IL- 4, 5, 6, 10.

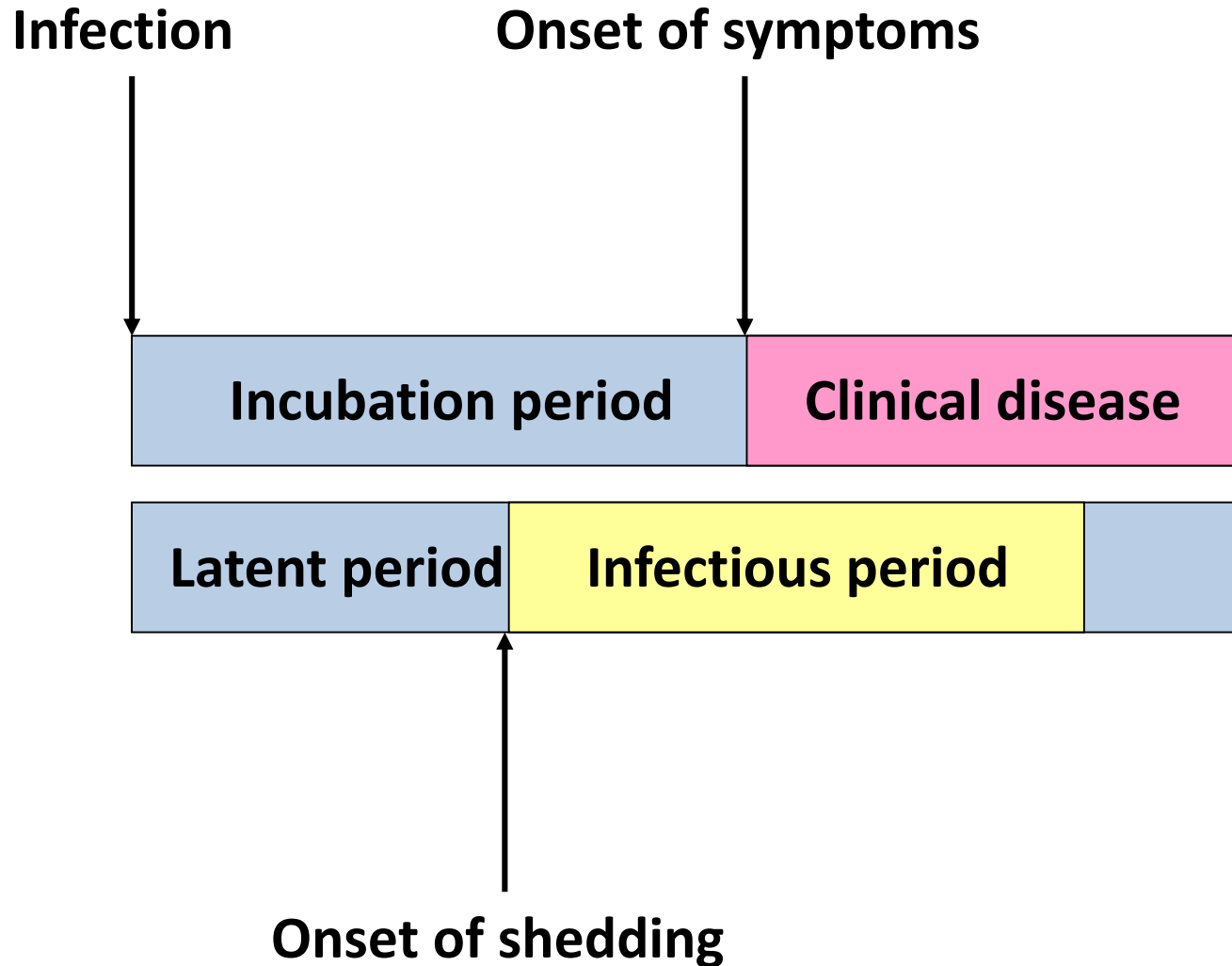
# Normal Micro flora & its importance

1. Prevent the growth of pathogens
2. Stimulate the immune system to produce antibodies that cross-react with invading pathogens
3. Aid in digestion of cellulose in ruminants.
4. Produce essential nutrients

# Inflammatory responses to infection

1. Suppurative inflammation
2. Mononuclear and granulomatous inflammation
3. Cytopathic-cytoproliferative inflammation
4. Necrotising inflammation
5. Chronic inflammation and scarring

# Terminology



# Manifestations of infectious process (Infection spectrum)

**Clearance of pathogen** (no infection)

**Covert infection** (subclinical infection)

**Overt infection** (clinical infection)

**Carrier states**

- ✘ Health carrier after covert infection.
- ✘ Convalescent carrier after overt infection.
- ✘ Incubatory carrier before onset of disease.

**According to carrier time:**

#acute (transient) carrier

#chronic carrier

**Latent infection**

# BY DURATION

- **Acute:** develops and runs its course quickly (has rapid onset followed by a relatively rapid recovery (measles, mumps, influenza etc.)
  - (eg., Bacterial endocarditis)
- **Chronic:** develops more slowly (insidious onset) and is usually less severe, but may persist for long indefinite period of time (tuberculosis, leprosy and syphilis etc.).
- **Latent:** Characterized by periods of no symptoms between outbreaks of illness (herpes Infections)

# BY LOCATION

- **Localized Infection:** Confined to a specific area of the body
- **Systemic Infection:** A generalized illness that infects most of the body with pathogens distributed widely in tissue.

# BY TIMINGS

- **Primary Infection:** Initial infection in a previously healthy person (cause disease as a result of their presence or activity with the normal, healthy host, and their intrinsic virulence – to reproduce and spread)
- **Secondary Infection:** Infection that occurs in a person weakened by a primary infection.

# Periods

- **The Incubation Period:** Time between infection and appearance of signs and symptoms.
- **The Prodromal Period:** Mild, nonspecific symptoms that signal onset of some disease.
- **The Clinical (climax) Period:** A person experiences typical signs and symptoms of disease
- **The Decline Period:** subsidence of symptoms.
- **The Convalescence Period:** Symptoms have disappeared, tissues heal and the body regains strength.

# Clinical manifestations

**(1) Mode of onset**

**(2) Type of fever**

**(3) Accompanying symptoms:**

**headache, myalgia, arthralgia etc.**

**(4) Signs:**

**Consciousness, jaundice, skin rash, buccal membrane, Koplik spot, eschar, subcutaneous hemorrhage, liver, spleen, lymph nodes.**

# Pathognomonic signs

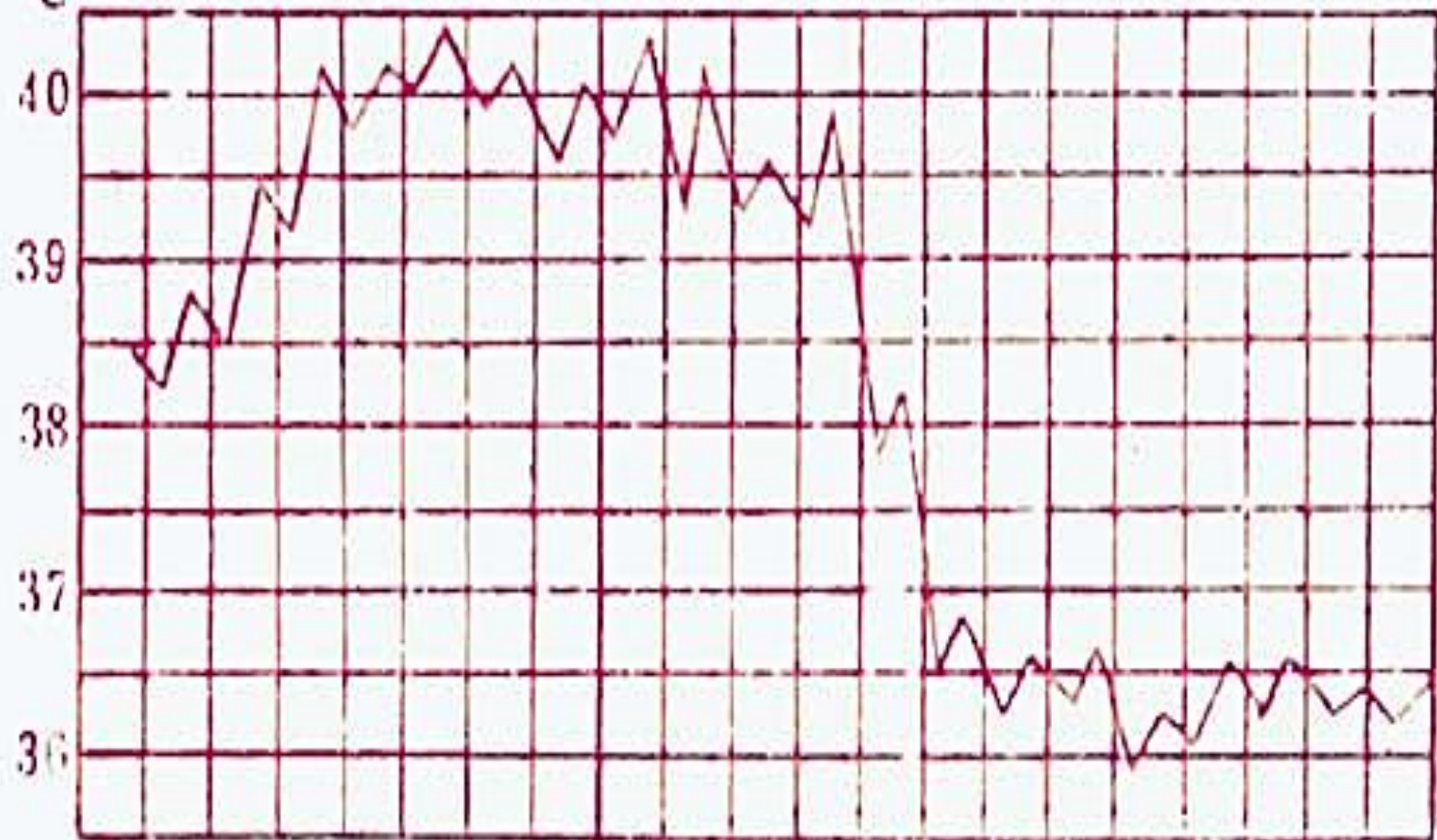
- **Measles: Koplik spots**
- **Mumps: swelling of parotid gland**
- **Scrub typhus: eschar**
- **Leptospirosis: myalgia, calf muscle**
- **Typhoid: rose spots**
- **Cysticercosis: subcutaneous nodules**
- **Hepatoencephalopathy: flapping tremor**
- **Schistosomiasis: urticaria**
- **Shigellosis: mucus-pus-bloody stool**
- **Amebic dysentery: strawberry jam-like stool**
- **Rabies: hydrophobia**

# Fever (pyrexia)

## Courses:

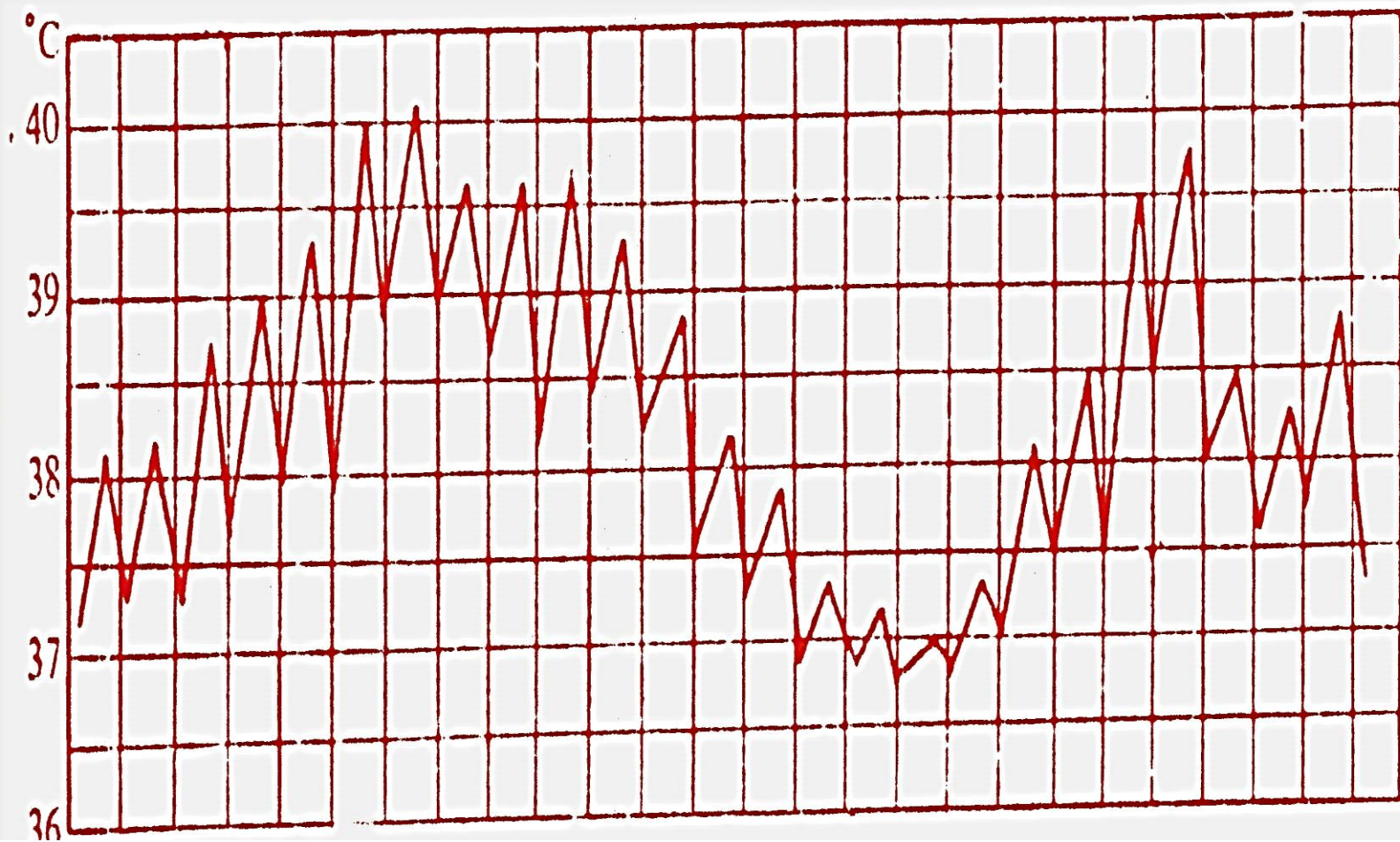
- A. **Effervescence:** early stage
- B. **Fastigium:** full-blown stage
- C. **Defervescence:** improvement stage

°C









## **A. Exanthem:**

Rash on skin surface

(e.g. Lyme disease erythema)

## **B. Enanthem:**

Rash on mucous membrane

(e.g. Koplik spots in measles)

# Toxemic symptoms

## **A. General presentations:**

malaise; headache; anorexia; pain in muscles, joints and bones; disturbance in consciousness; meningeal irritation; septic shock; liver and kidney failure, etc.

## **B. Reticulo-endothelial system reactions:**

hepatomegaly,  
splenomegaly,  
lymphadenopathy.

# Laboratory Examinations

- **Routine tests:** CBC, urine test, ovascopy, VDRL, fluorography + (age > 40 years) ESG, blood glucose
- **Tests due to severity or specific signs:** liver function test, kidney function test etc.

# Detection and isolation of pathogens

- A. Adequate collection and transportation of specimens.
- B. Direct examination:
  - macroscopy** (e.g. *Ascaris lumbricoides*, *Enterobius vermicularis*, etc.)
  - microscopy** (e.g. *Plasmodium* spp., *Cryptococcus neoformans*, *Mycobacterium tuberculosis*)

# Detection and isolation of pathogens

## C. Culture by artificial media or tissue culture

**Media culture** (Entamoeba histolytica, Shigella, Salmonella, etc.)

**Tissue culture** (dengue virus, poliovirus, etc.)

## D. Animal inoculation

**Intraperitoneal inoculation** (Rickettsia tsutsugamushi)

**Intracerebral inoculation** (encephalitis virus)

# Detection and isolation of pathogens

**E. Specific antigen detection:** agglutination test, ELISA, EIA, FAT, RIA, flow cytometry, etc.

**F. Molecular biologic assay:** Using isotope or non-isotope probes; Polymerase chain reaction (PCR), etc.

# **Nobel prize in 1993 for development of PCR method**



**Kary Mullis  
1944**

# Other tests

- **T-cell subset assay** (e.g. for AIDS)
- **Skin test** (e.g. for tuberculosis, cysticercosis)
- **Fibro-optic endoscopy** (e.g. for chistosomiasis)
- **Imaging:** X-ray, ultrasound, CT, MR (e.g. for amebic liver abscess)
- **Biopsy** (e.g. for chronic hepatitis)

# Special techniques for diagnosing infectious agents

|                             |   |
|-----------------------------|---|
| <b>Gram stain</b>           | Most bacteria                                   |
| <b>Acid-fast stain</b>      | Mycobacteria, nocardiae                         |
| <b>Silver stains</b>        | Fungi, legionellae, pneumocystis                |
| <b>Periodic acid-Schiff</b> | Fungi, amoebae                                  |
| <b>Mucicarmine</b>          | Cryptococci                                     |
| <b>Giemsa</b>               | Campylobacteria, leishmaniae, malaria parasites |
| <b>Antibody probes</b>      | Viruses, rickettsiae                            |
| <b>Culture</b>              | All classes                                     |
| <b>DNA probes</b>           | Viruses, bacteria, protozoa                     |

# Aim of treatment

- Not only for alleviation of symptoms and signs, but also for isolation of patients to prevent propagation of infection to the community.
- Comprehensive treatment includes drug therapy, nursing care and isolation.
- Pay attention to both aetiological, specific and symptomatic treatments.

# Therapeutic methods

- (1) General and supportive treatment.
- (2) Etiologic (specific) treatment.
- (3) Symptomatic treatment.
- (4) Rehabilitation therapy for sequelae.

# TREATMENT

- ANTIBIOTICS
- ANTIVIRAL DRUGS
- ANTI PROTOZOAL DRUGS
  - Sensitivity
  - Dosage, concentration
  - Method of administration
  - Side effects
  - Scheme and duration
  - Stable concentration

# TREATMENT

## ❖ SPECIFIC IMMUNOTHERAPY

- Immunoglobulin
- Gamma - globulin
- Blood serum
- Immune serum (antitoxic, antimicrobial)

## ❖ NONSPECIFIC IMMUNOTHERAPY

- Immunostimulants
- Immunosuppressors
- Interferon inducers
- Human immunoglobulin

# TREATMENT

## ❖ DEZINTOXICATION (PO, IV)

- Colloid solutions
- Sorbents

## ❖ REHYDRATION (PO, IV)

- Polyionic crystalloid solutions



DESENSIBILIZATION



DYSBIOSIS CORRECTION



ENZYMES



VITAMINS



SYMPTOMATIC TREATMENT

# PROPHYLAXIS

## ❖ SPECIFIC IMMUNOPROFILAXIS

- Vaccines (active)
- Primary (toxoids, pertussis, polio, hepatitis B, haemophilus influenzae type B, MMR)
- With special indications (influenza, meningococcal)
- Specific antisera (passive)
- normal human immunoglobulin
- hyperimmune serum
- animal sera

## ❖ NONSPECIFIC IMMUNOPROFILAXIS

- Immunostimulant
- Interferon, inductors

# PROPHYLAXIS

**Isolation of patients:** until the patient becomes non-infectious.

**Quarantine of contacts:** until the incubation period of the infectious disease is over.

**Identification and treatment of carriers.**

**Control of infected animals:** Eradication or therapy.

# PROPHYLAXIS

## **Interrupt the routes of transmission:**

- (1) General hygienic measures: Clean drinking water supply, food hygiene, correct sewage disposal.
- (2) Disinfection and eradication of insect vectors.
- (3) Intervention of parasite life cycles (e.g. eradication of snails in endemic area of schistosomiasis)

# PROPHYLAXIS

## Protection of the susceptible persons:

(1) Immunological prophylaxis:

**Active** (vaccination): intracutaneous inoculation with smallpox vaccine, subcutaneous inoculation with hepatitis B vaccine.

**Passive** (immunoglobulins): intramuscular injection with antibodies against tetanus bacillus.

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# PROPHYLAXIS

- (2) **Protection from environmental factors**  
(e.g. mosquitoes bites, skin penetration by *Leptospira* and hookworm larvae.
- (3) **Chemo-prophylaxis:** artesunate against malaria

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