PSMU
Department of microbiology, virology and immunology

• Infection and infectious process

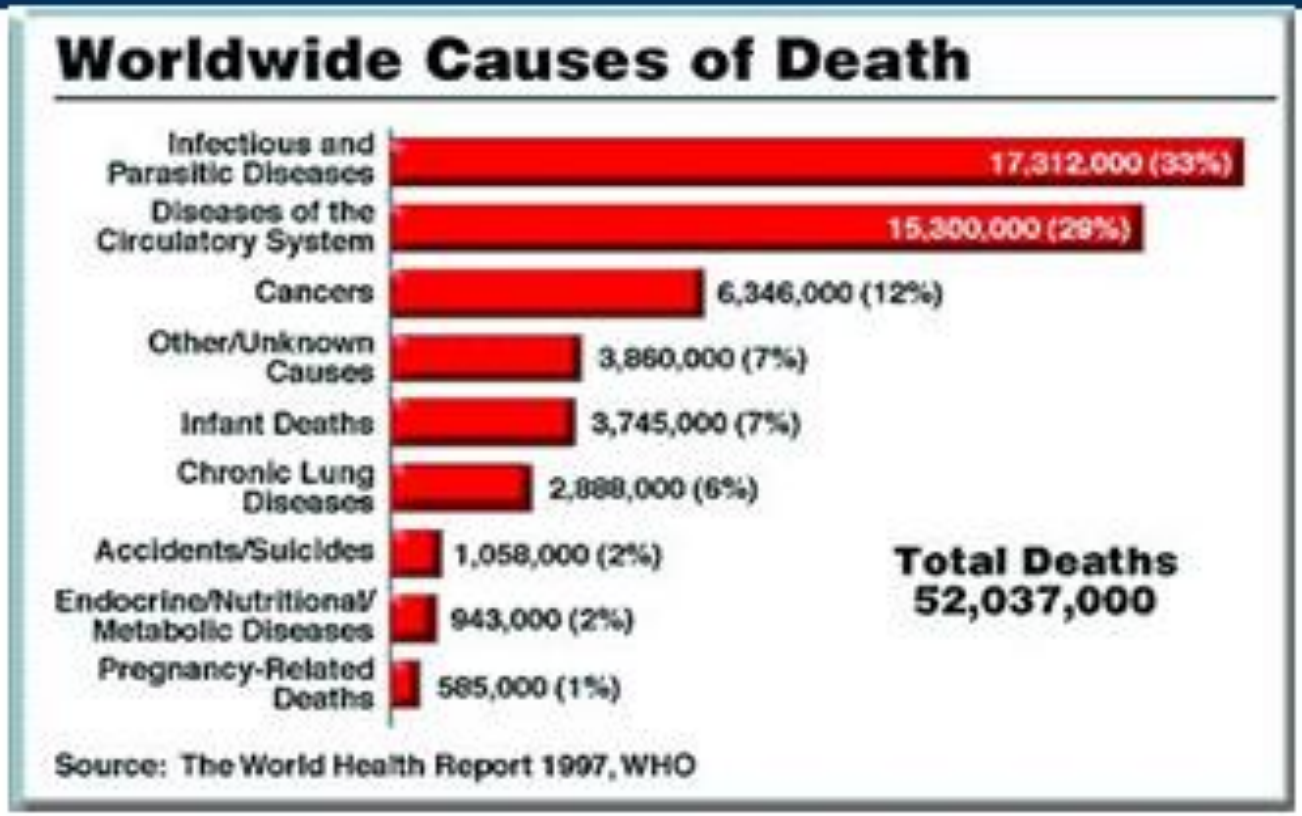
Connection

- **For two-way communication between the lecturer and students during the lecture, please contact o.hancho@pdmu.edu.ua**

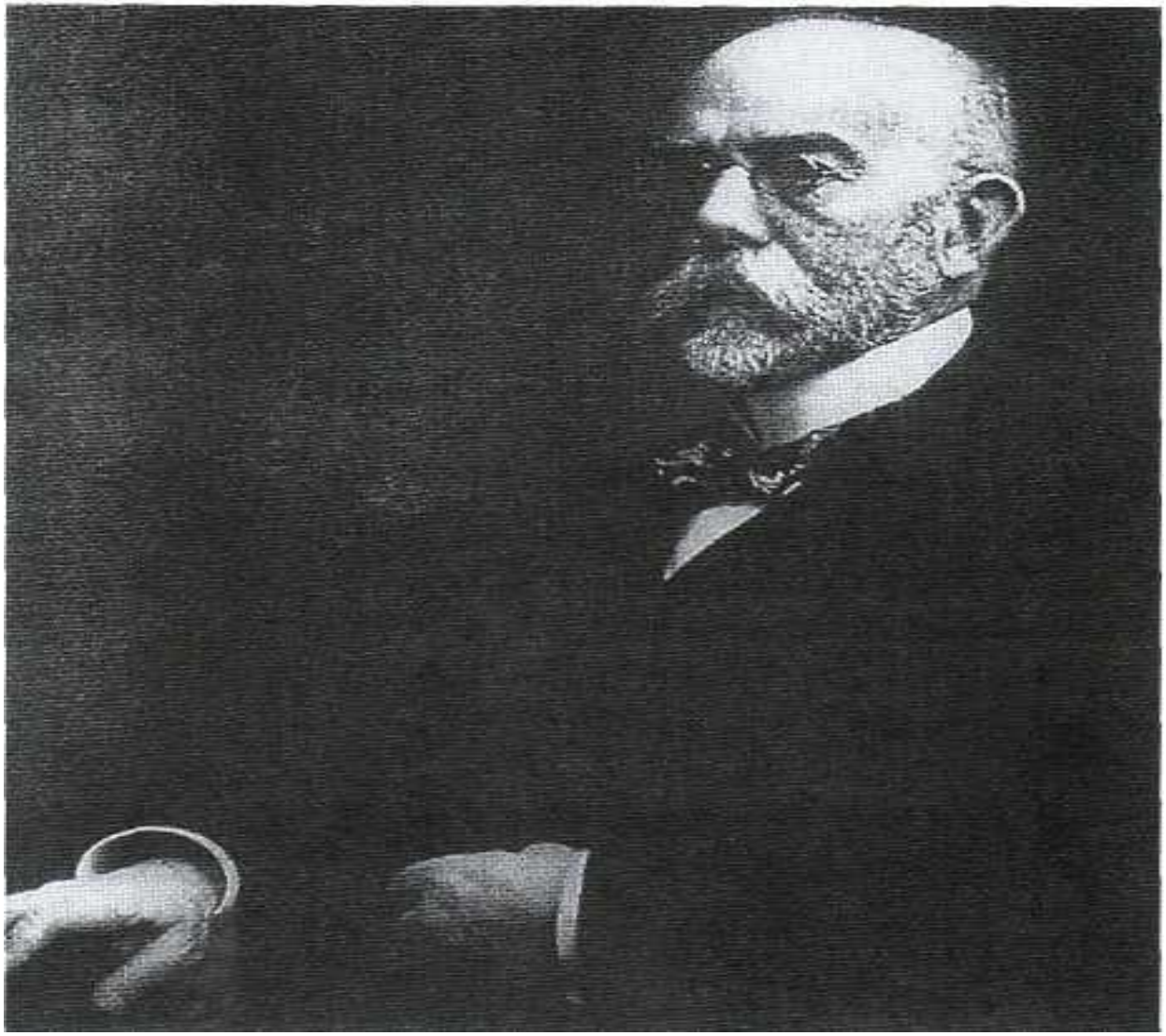
Conception of an infection

- Infection is the invasion and multiplication of microorganisms such as bacteria, viruses, and parasites that are not normally present within the body.

Причини смертності від хвороб

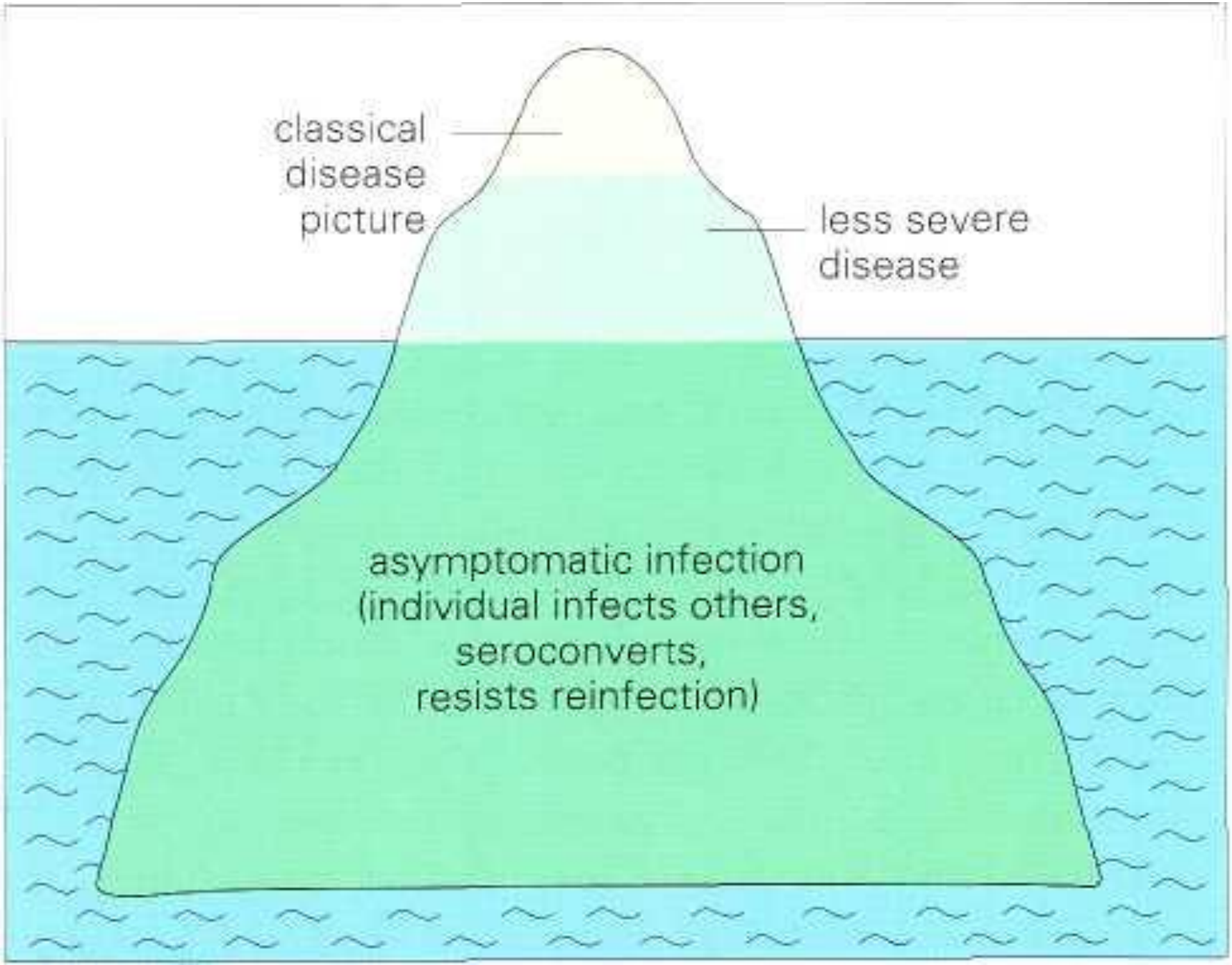


Robert Koch (1843-1910)

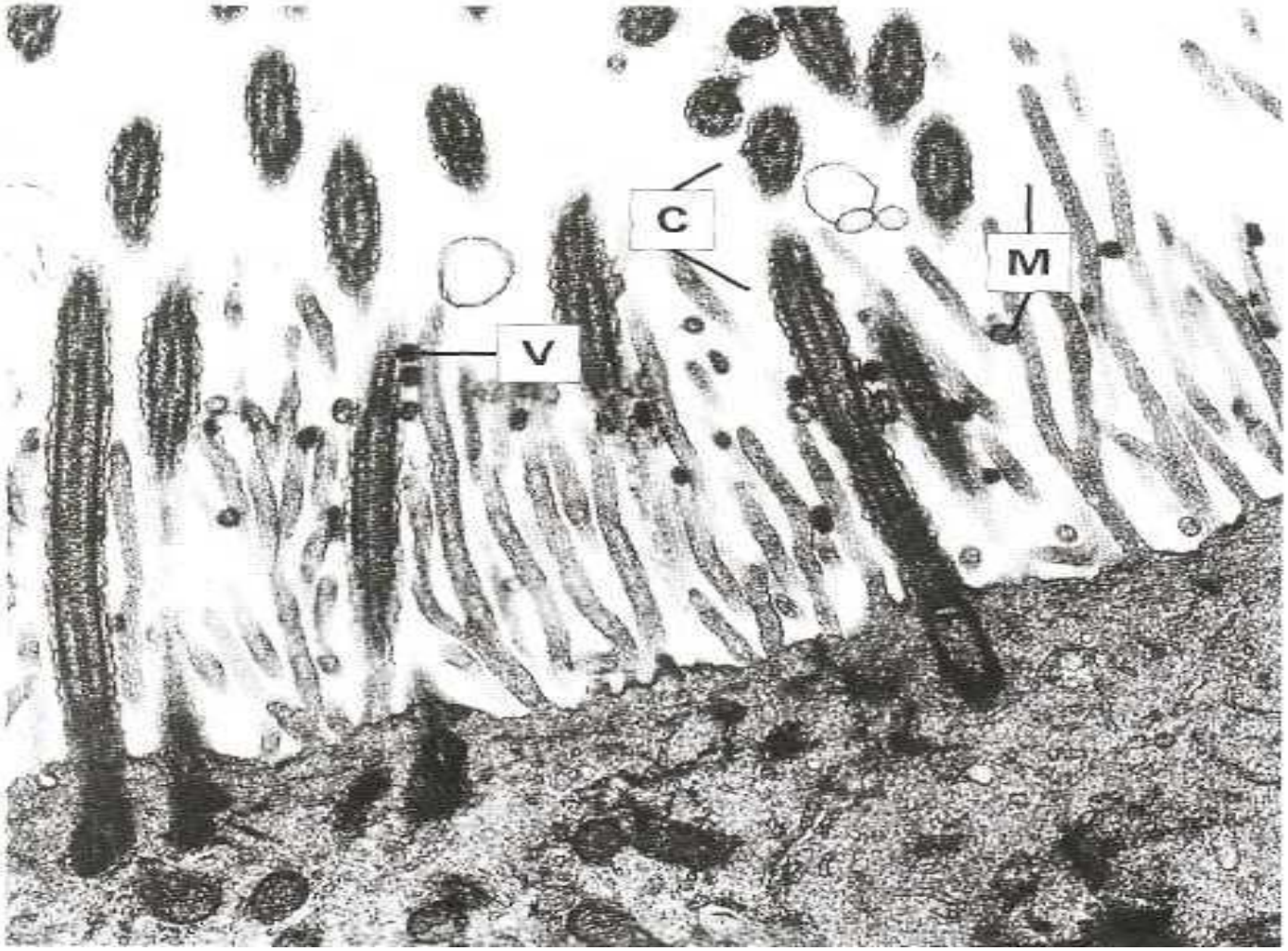


In 1890, Robert Koch set out as 'postulates' the following criteria

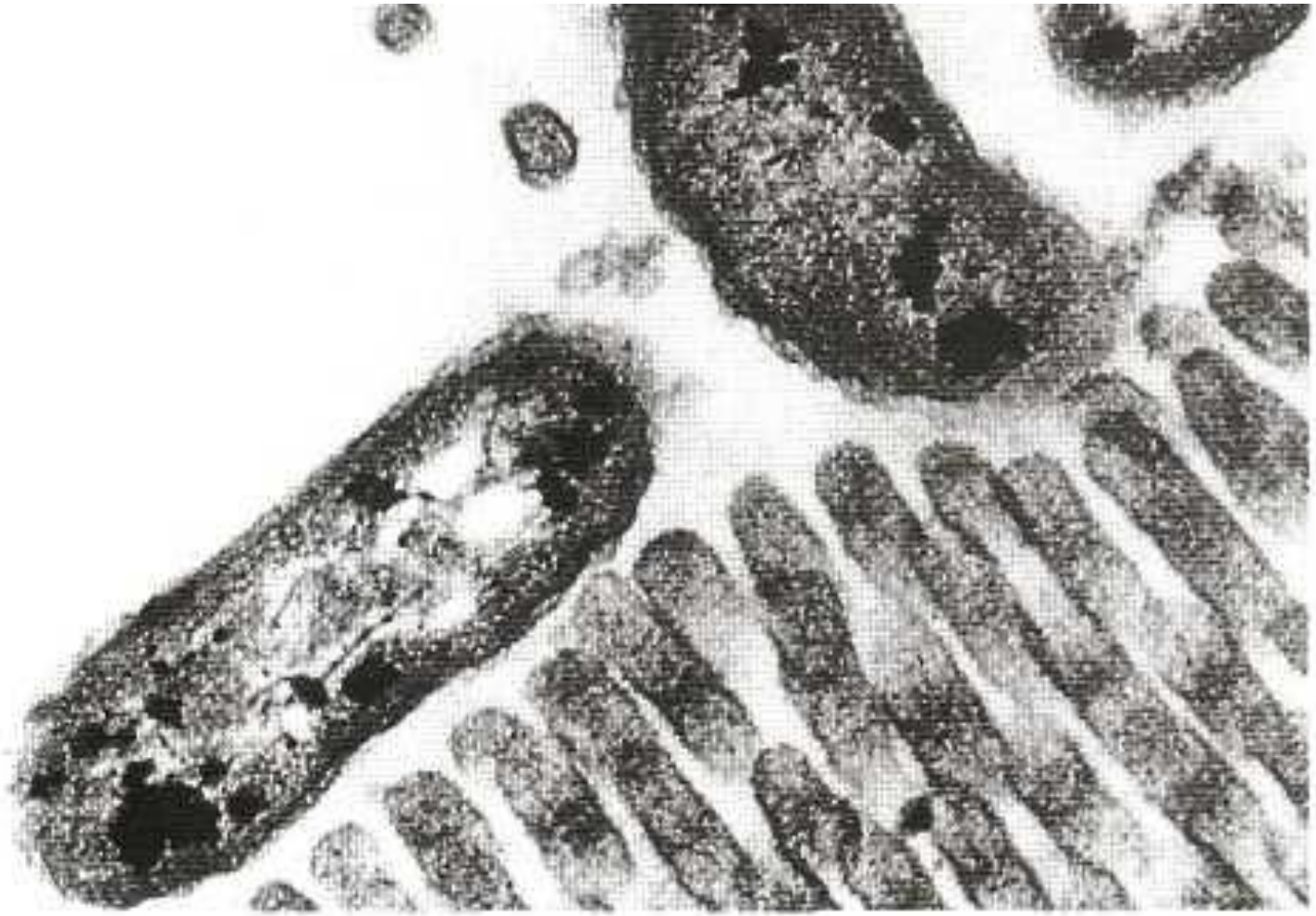
- **The microbe must be present in every case of the disease.**
- **The microbe must be isolated from the diseased host and grown in pure culture.**
- **The disease must be reproduced when a pure culture is introduced into a non-diseased susceptible host.**
- **The microbe must be recoverable from an experimentally infected host.**


classical
disease
picture
less severe
disease
asymptomatic infection
(individual infects others,
seroconverts,
resists reinfection)

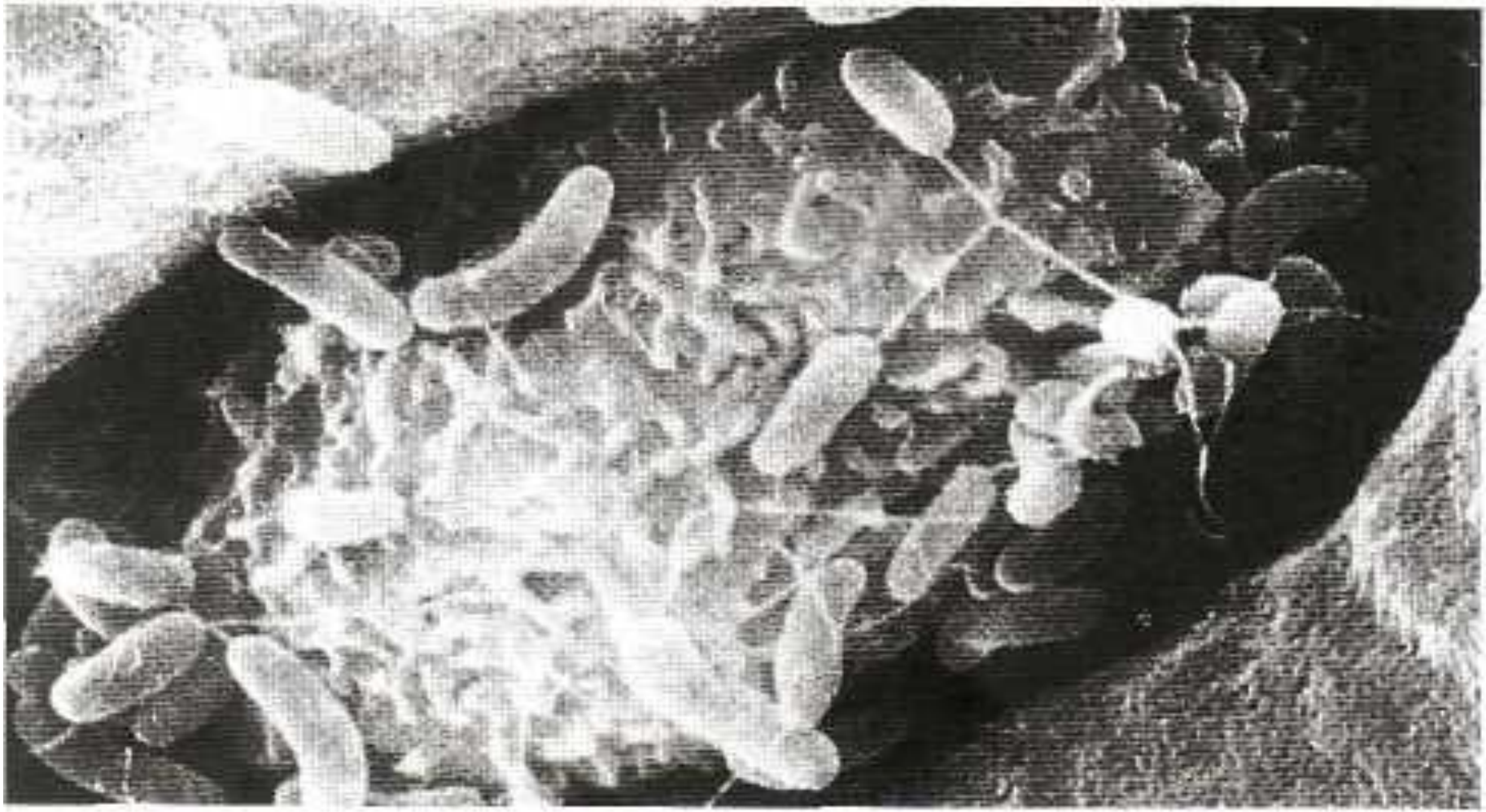
Adhesion



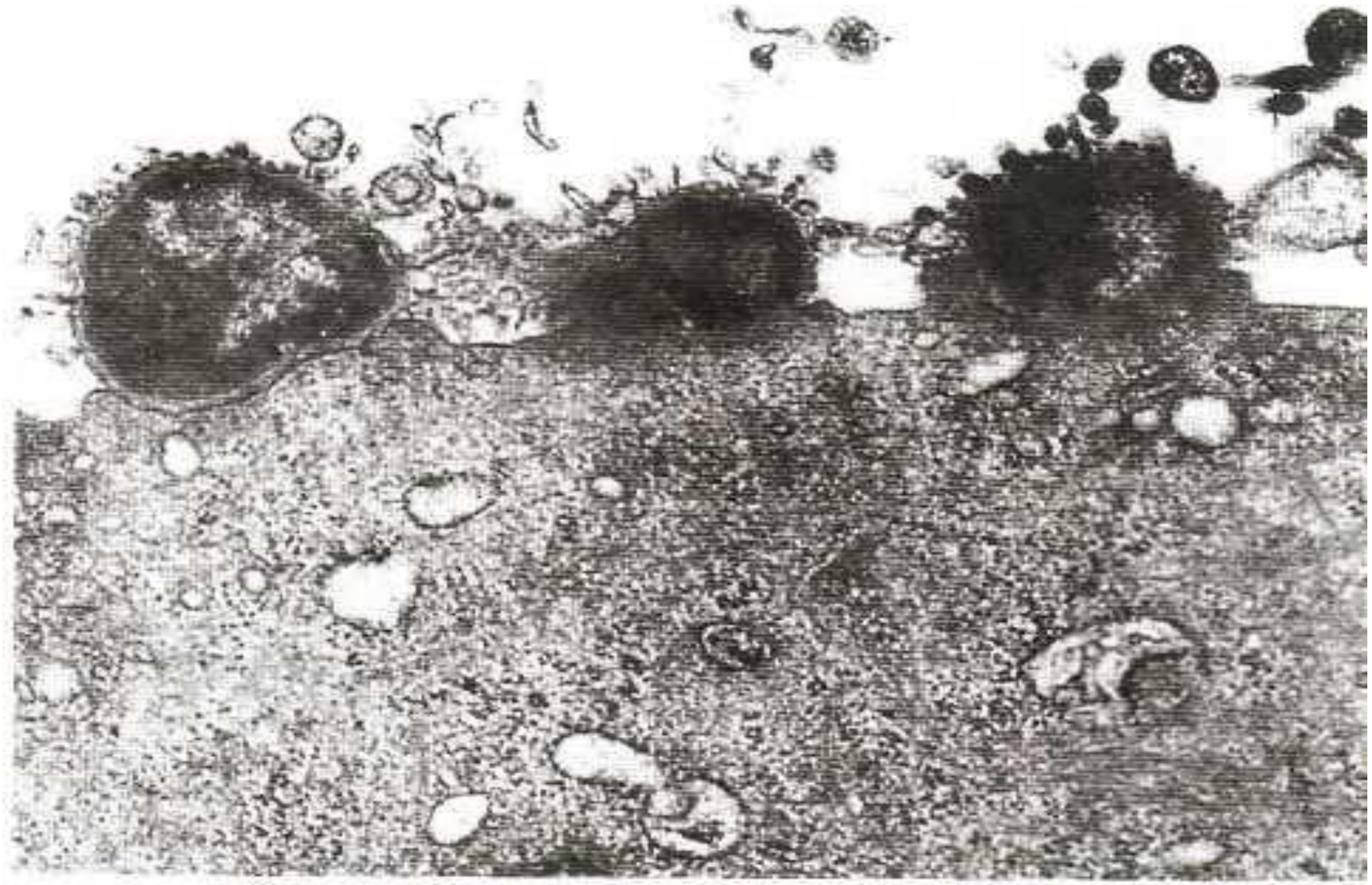
Microbial attachment in the intestinal tract.



Adherence of *Vibrio cholerae* to M cells



Adherence of gonococci to the surface of a human urethral epithelial

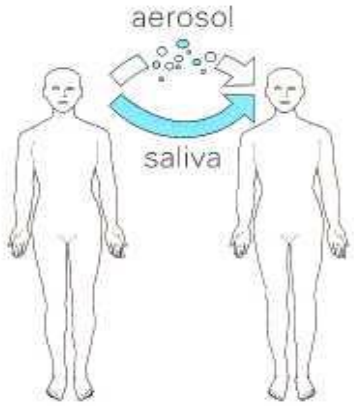


Transmission

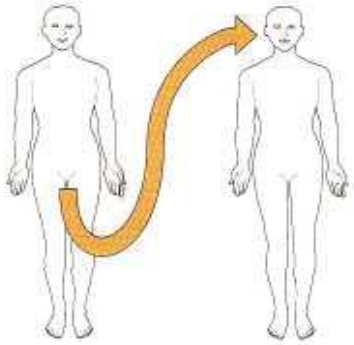
- **Transmission depends upon three factors:**
- **the number of microorganisms shed;**
- **the microorganism's stability in the environment;**
- **the number of microorganisms required to infect a fresh host (the efficiency of the infection).**

types of transmission and their control

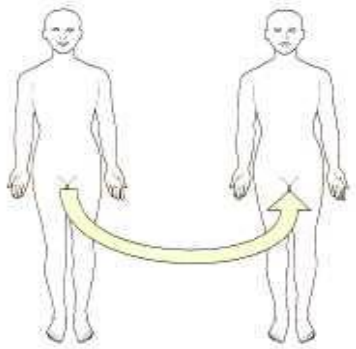
respiratory or salivary spread
not readily controllable



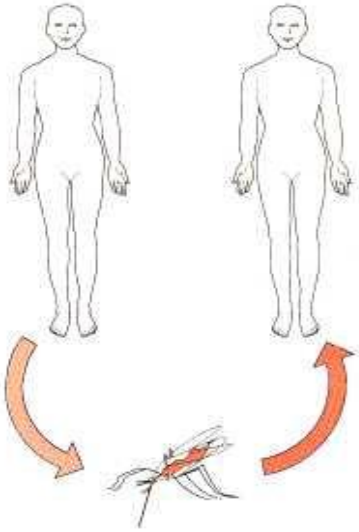
fecal–oral spread
controllable by public health measures



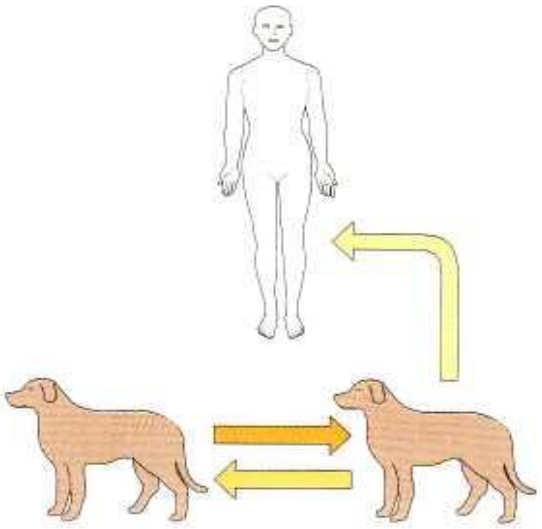
venereal spread
difficult to control as
social factors are involved



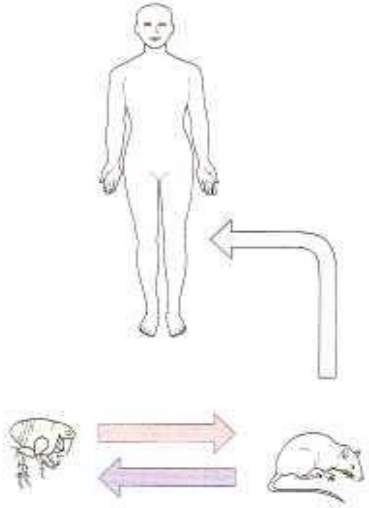
arthropod-borne infections and zoonoses



vector (biting arthropod)
malaria
sandfly fever
typhus (louse-borne)

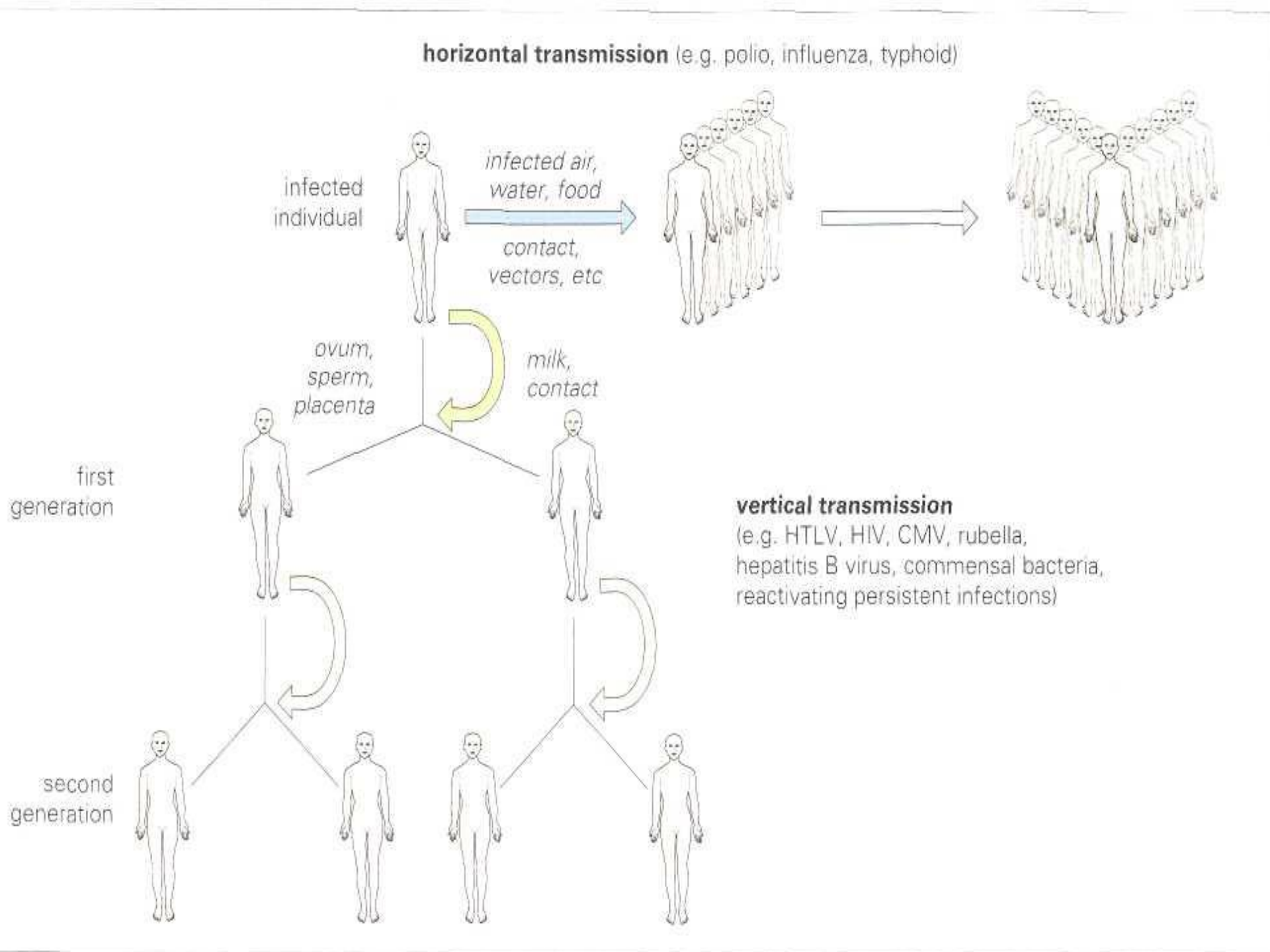


vertebrate reservoir
brucellosis, rabies
Q fever, lassa fever
salmonellosis

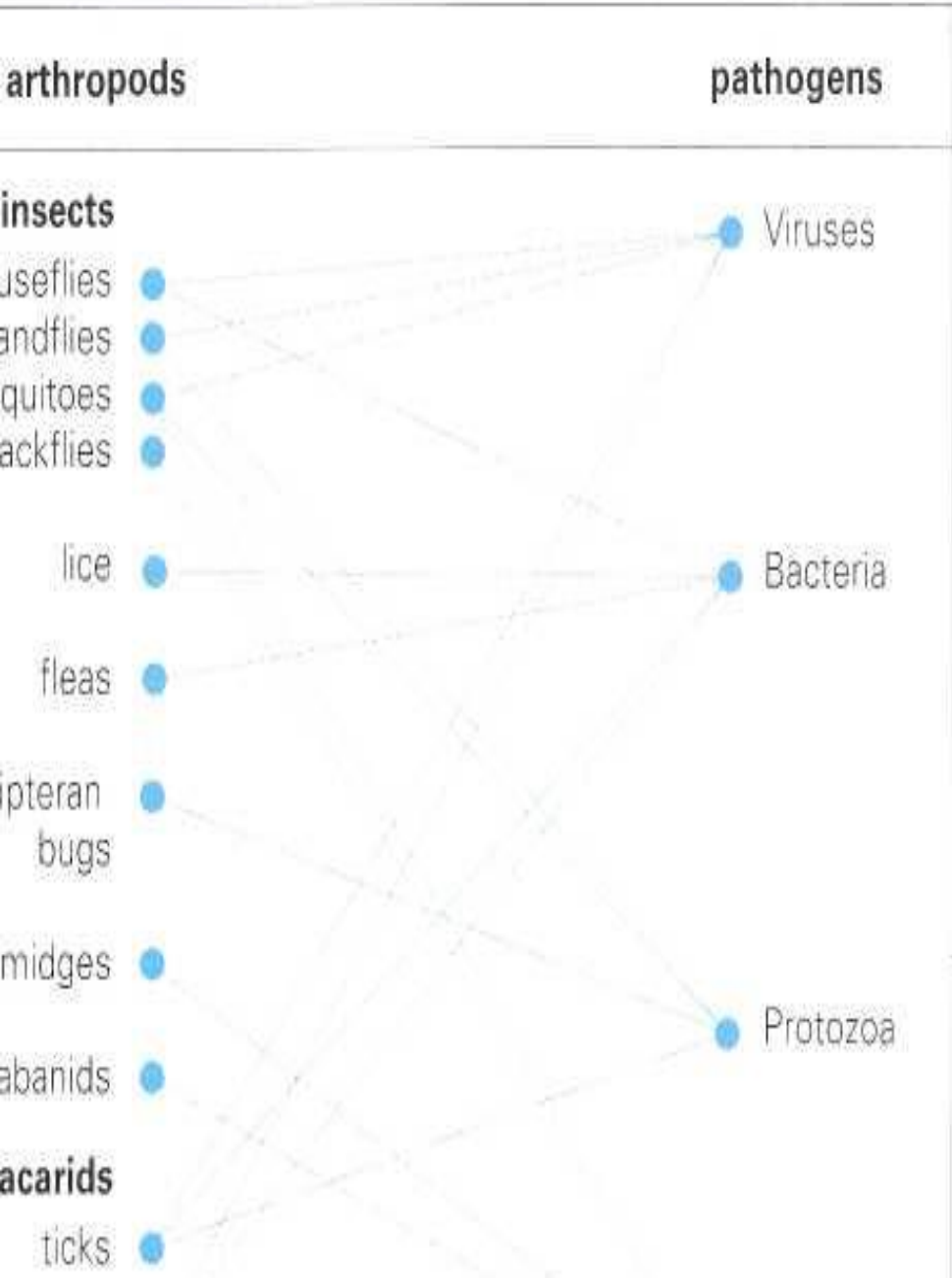


vector–vertebrate reservoir
plague
trypanosomiasis
yellow fever

Droplet dispersal following a violent sneeze

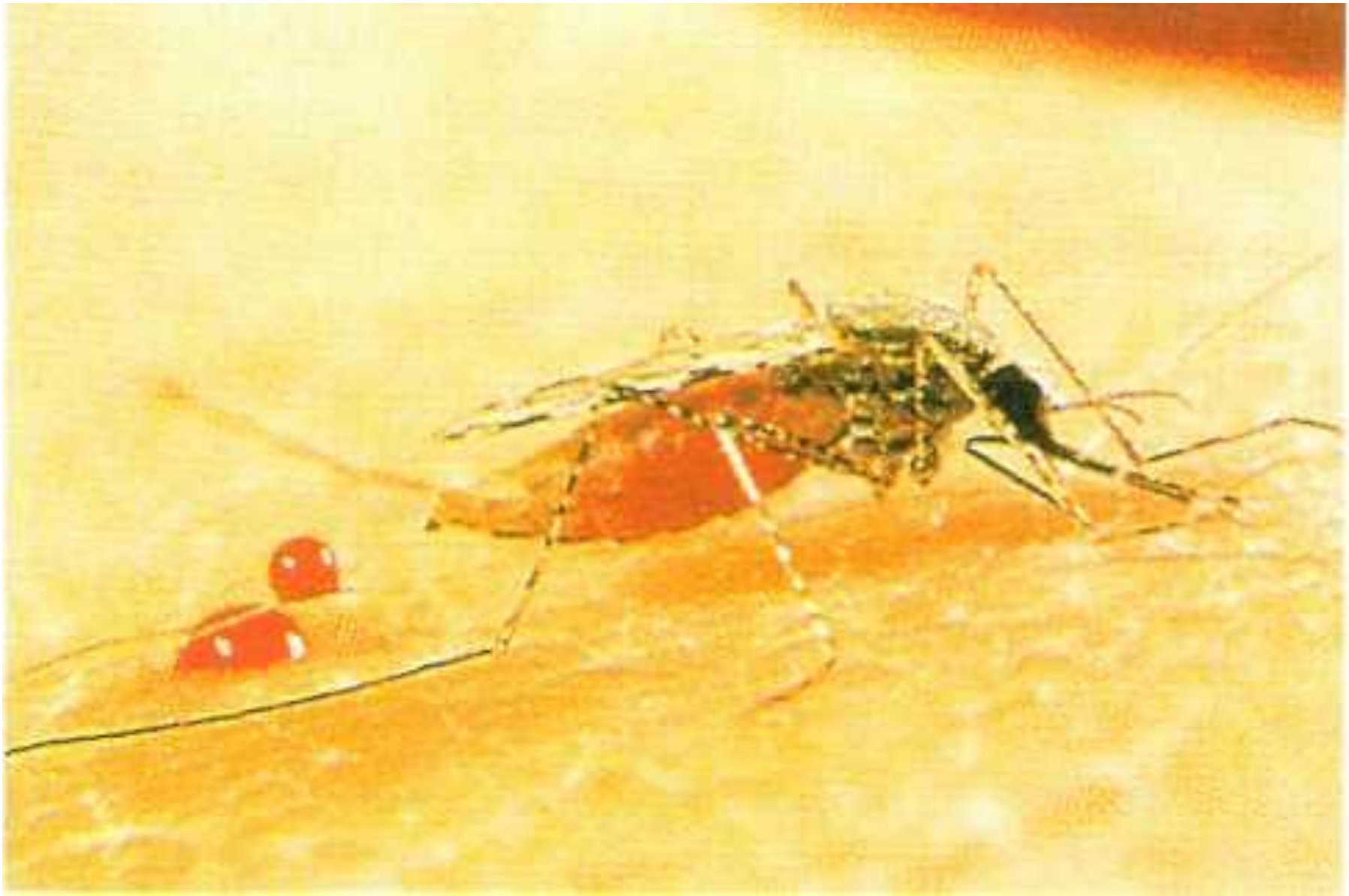

horizontal transmission (e.g. polio, influenza, typhoid)
infected individual
infected air, water, food
contact, vectors, etc
ovum, sperm, placenta
milk, contact
first generation
second generation
vertical transmission
(e.g. HTLV, HIV, CMV, rubella, hepatitis B virus, commensal bacteria, reactivating persistent infections)

ARTHROPOD-BORNE PATHOGENS

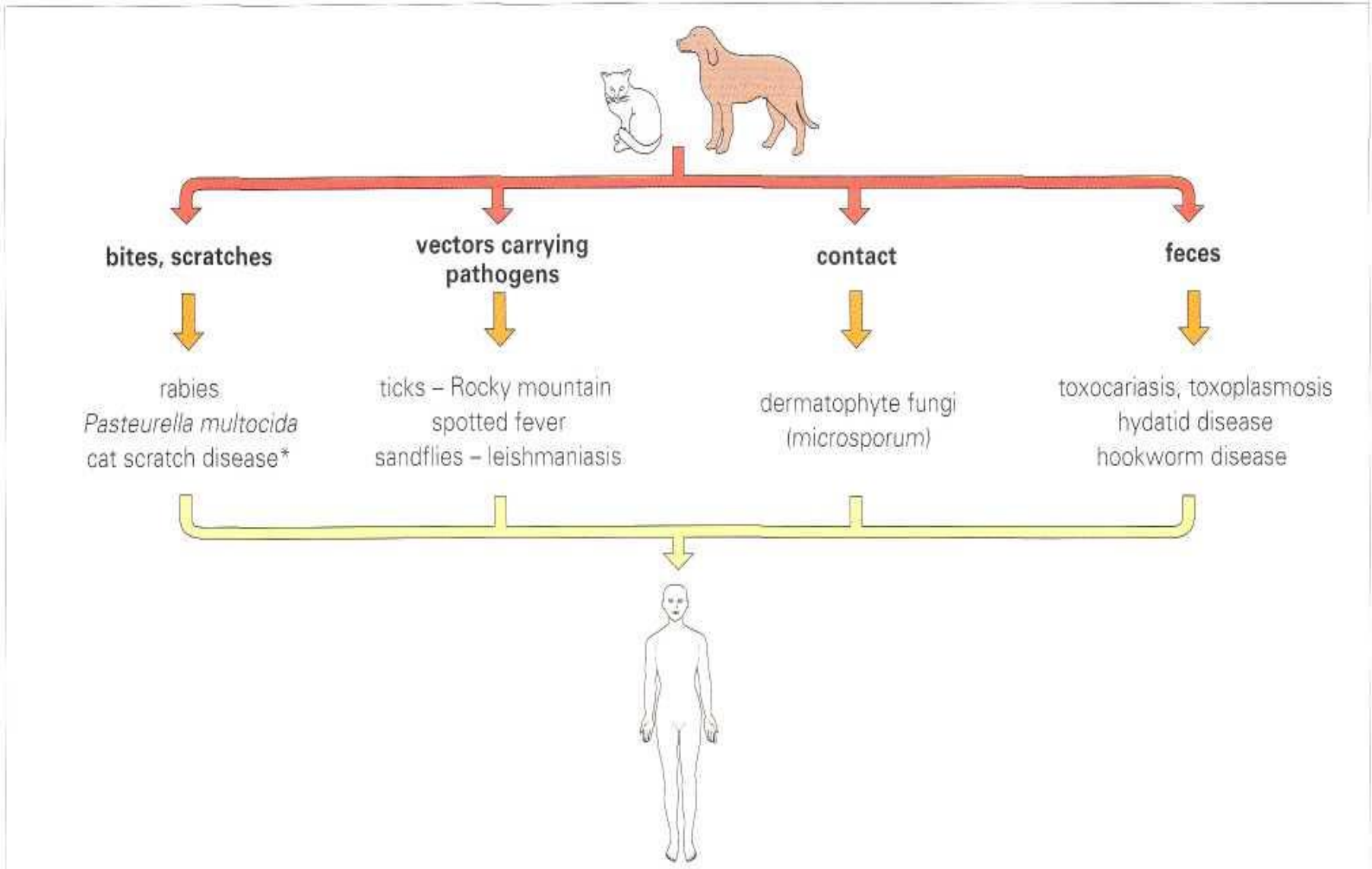


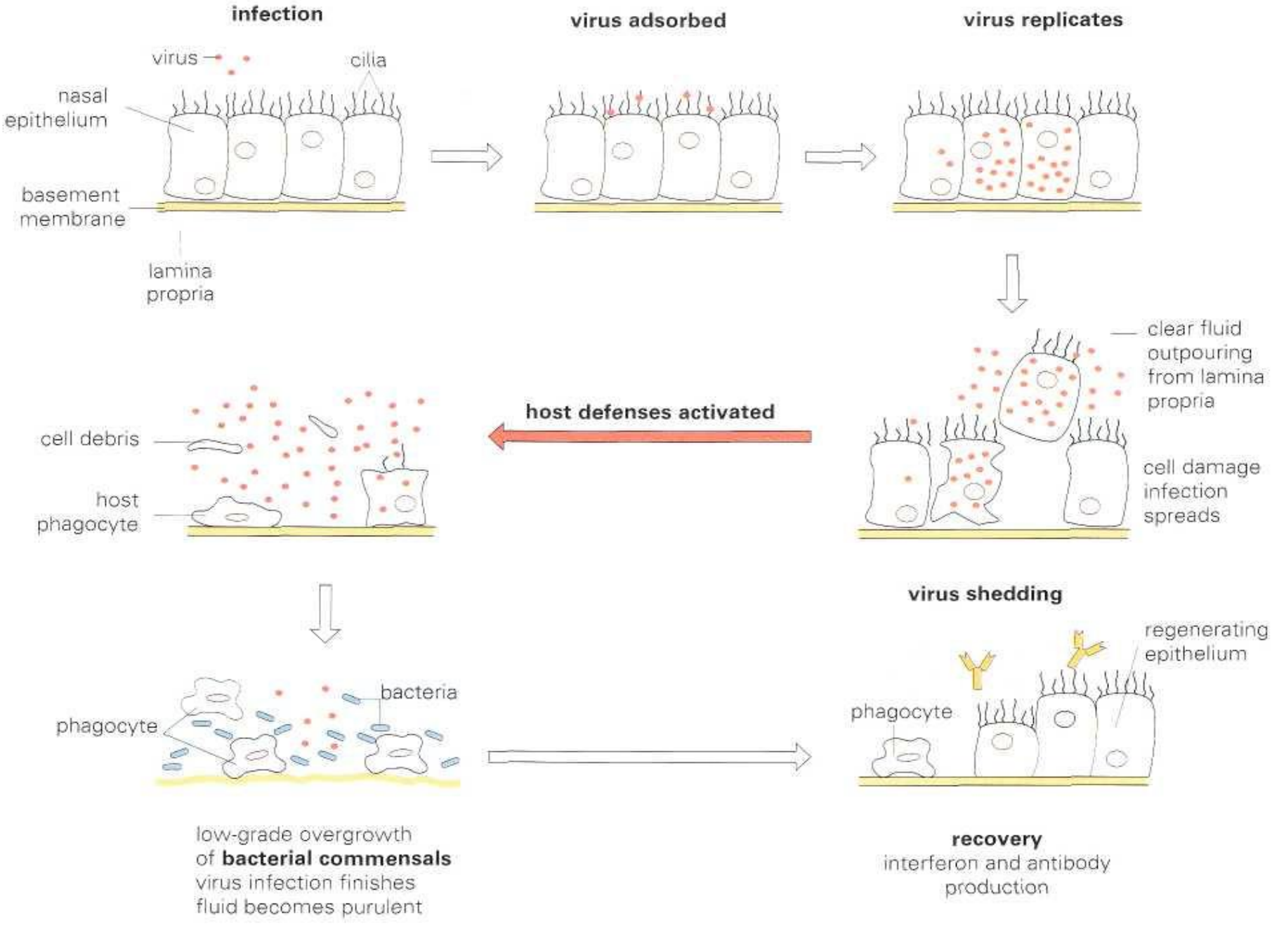
types	diseases
Flaviviruses	yellow fever, dengue, febrile diseas encephalitides
Bunyaviruses	hemorrhagic fevers
Yersinia	plague, tularemia
Rickettsias	Q fever, spotted fevers, typhus, rickettsial pox
Spirochaetes	relapsing fever, Lyme disease
Trypanosomes	sleeping sickness, Chagas' disease
Leishmania	leishmaniasis
Plasmodium	malaria

Female *Anopheles* mosquito feeding

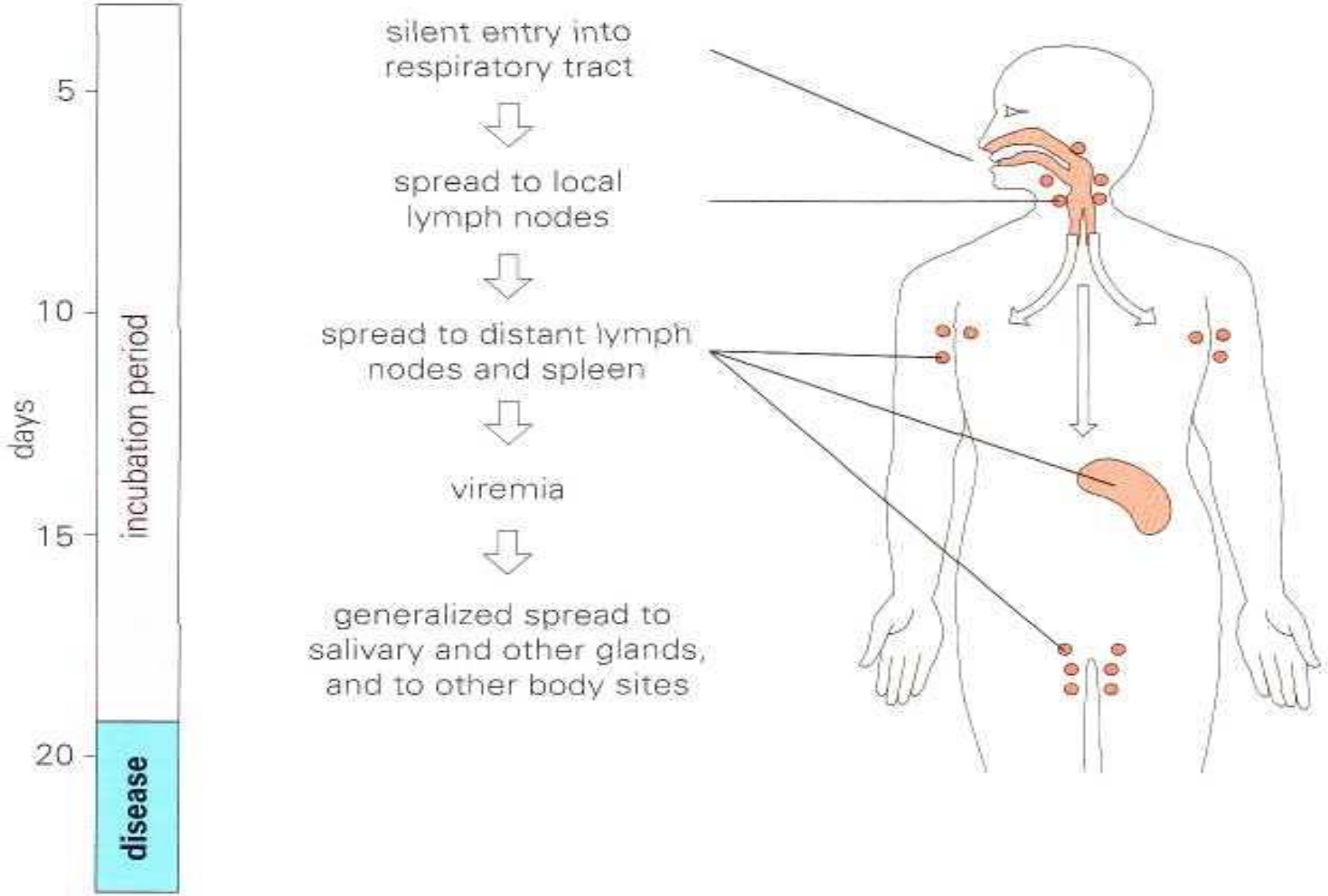


Zoonoses transmitted from dogs and cats




infection
virus
cilia
nasal epithelium
basement membrane
lamina propria
virus adsorbed
virus replicates
clear fluid outpouring from lamina propria
cell damage infection spreads
host defenses activated
cell debris
host phagocyte
virus shedding
regenerating epithelium
phagocyte
bacteria
phagocyte
low-grade overgrowth of **bacterial commensals** virus infection finishes fluid becomes purulent
recovery
interferon and antibody production

The pathogenesis of mumps



TRANSMISSION OF MICROBES IN THE BODY

During the development of the infectious process, microbes from the primary focus can enter the blood stream, and can be carried through the whole body. This condition is known as **bacteriemia**, or **virusemia** -during the viral diseases.

TRANSMISSION OF MICROBES IN THE BODY

In a number of infectious diseases, sepsis or septicaemia may occur with the infestation of many organs and tissues of the body by microbes. Sepsis is characterised not only by the presence of pathogenic microbes in the organ and tissues, but also by reactive phenomena accompanied by the inflammation end degeneration of the cells.

TRANSMISSION OF MICROBES IN THE BODY

The septic process accompanied by the production of purulent foci in different organs and tissues is known as **septicopyemia**

Forms of manifestation of infections.

According to their manifestation, infections are subdivided into acute and chronic, obvious and latent, mixed and secondary. **Acute** infections are characterized by a sudden onset and comparatively short course.

Forms of manifestation of infections.

Some infectious diseases can occur **atypically** without typical clinical manifestation. These forms of infection are called **latent**, or silent during which the causative agent for a long period of time can be found in tissues or organs not causing clinically marked response reactions of the microorganism. In some cases, herpes, malaria, meningitis, may occur latently.

Forms of manifestation of infections.

When infection occurs not with one species of causative agent, but with two or more one speaks of **mixed** infection /measles/ and tuberculosis.

Forms of manifestation of infections.

In some cases infection causes a weakening of the body which then becomes susceptible to other diseases. Thus, for example, after measles pneumonia can occur. This is known as **secondary** infection.

Forms of manifestation of infections

Reinfection is a repeated infection by the same species. **Superinfection** is a fresh infection of the body in which the main disease has not ended. **Relapse** is a return of symptoms of the same disease.

Forms of manifestation of infections

According to their nature infectious disease are subdivided into **exogenous** when the causative agent penetrates the macroorganism from the environment, and **endogenous** which are a result of activation of the indigenous microbes of the body.

THE INTENSITY OF THS SPRED OF INFECTIOUS DISEASES

Infectious diseases may be registered as **sporadic** cases in a given area during a certain period of time.(For example typhoid fever is registered in different districts of the city). These cases are not connected with the same source of infection.

THE INTENSITY OF THS SPRED OF INFECTIOUS DISEASES

Epidemic - is a considerable increase in the level of sporadic incidence of a gives disease. When the epidemic reaches an unusually large size in some country or spreads over many countries or even continents, it is called a pandemic. For example Spanish influenza in l9l8-l9l9, or plague in УI and XIV centuries.

Epidemic is a special forms of the spead of infectious diseases, in which infectious disease are retained for a long time in some locality, or it is a place where geographical, social and climatic condition are favorable for spreading of infectious diseases. / Plague in Tanzania, Cholera in India/.

The morbidity rate of infectious disease is estimated by the amount of infected per l0,000 or l00,000 of the population during the year. The mortality rate is determined as the total number of deaths from the given disease per l00,000 population. Fatality is expressed as a percentage of the number of dead per l00 infected.


Thanks for attention!