COMMUNICABLE DISEASES I.

BASIC ELEMENTS
Review of microbiological knowledge.
Basic definitions of communicable diseases and epidemics.
Global epidemiology of communicable diseases.
Epidemiology of communicable diseases
as a PRIORITY SECTOR OF PUBLIC HEALTH

science of the COMMUNICABLE DISEASES (CONTAGIONS)

-INDICATORS: INCIDENCE, PREVALENCE ETC.
-RISK FACTORS
-PREVENTIONAL PROBLEMES, PROPHYLAXIS

INFECTOLOGY:
- Clinical disciple on
  - occurrence
  - patomechanism
  - clinical course
  - treatment and
  - preventional facilities OF INFECTIOUS DISEASES
• **Infectious disease** – caused by a microorganism and therefore potentially transferable to new individual

• **Contagious disease** - capable of spreading from one person to another

• **Communicable disease** – can be transmitted from one source to another
GOALS AND FUNCTIONS

Main goals of epidemiology of communicable diseases:

1. prevention and surmount of communicable diseases and epidemics

2. enhancement of general resistance of human organism against communicable diseases

picture: one of the victims of 1979’s Ebola epidemic
IMMUNITY:

-SPECIFIC:-ACQUIRED ADAPTIVE
- immunoresponse on a given antigen
-NON-SPECIFIC(INNATE)
- general resistance of an organism to a given infectious agent

SPECIFIC: INNATE AND ADAPTED
-INNATE : breedal and maternal
-ADAPTED: natural and arteficial

NATURAL:
- after a disease with clinical symptoms
- after a latent infection

ARTEFICIAL (IMMUNISATION):
- active (applying antigens: vaccination)
- passive (applying specific and aspecific immunosera)
CHARACTERAL ASPECTS OF ANTI INFECTIOUS DEFENSIVE SYSTEM OF OUR ORGANISM (IMMUNITY)

- **aspecific** (general resistance):
  - **enhancing factors:**
    - good life-conditions, bacterial vaccines, BCG vaccines, radio-orchemically detoxified endotoxines - good immunadjuvants
  - **attenuative factors:**
    - bad life-conditions: stress, bad meteorological factors, bad weather conditions, food-deficit, irradiations, infections, fever, shock, medicaments, chemical effects

- **specific defense**
  - immunoresponse has not given on the infectious agent, but on an antigen (antigen-specific immunity)
  - **genetical neutrality** : diseases affected by an infectious agents will be harmful only for determined breeds
    - for ex.: parvoviral attack
      - (in humans only the parvoB19 virus may cause disease - the fifth infectious disease)
INFECTION

-a specific pathological process:
the entry and development or multiplication of an infectious agent in the body of persons or animals enforces, provokes the organism on a response (immunoresponse)

a battle of two biological systems:
MICROORGANISM and MACROORGANISM

DETERMINANT FACTORS IN OCCURRENCE OF COMMUNICABLE DISEASES

- side of microorganisms:
  - pathogenicy: ability of an infectious agent to generate disease
    (-opportunists? pathogens?)
  - virulence – degree of pathogenicy
for ex.:
  1. BCG – immunisation with decreased virulence - stems
  2. natural passage: increases or decreases the virulence of microbs

- side of macroorganisms:
  - status of general resistance in the organism:

Will be developed a disease and in what clinical forme?
INFECTIOUS DISEASE:

ACUTE OR CHRONIC DISEASE

- ACCOMPANIED WITH PATHOLOGICAL ALTERATIONS and
- MANIFESTED IN ADEQUATE CLINICAL SYMPTOMS IN HOST,

TRIGGERED BY

1. PATHOLOGIC EFFECTS OF INFECTIOUS AGENT
   TOXINS
   ENZYMES
   JUNCTIONAL MEMBRAN-COMPONENTS
   VIRULENCE-FACTORS
   VIRAL INFECTION-CAUSED CYTOLYSIS
   CELL-PROLIFERATION

2. IMMUNORESPONSE OF ATTACKED ORGANISM
   (INFLAMMATORY, ALLergic, AUTOIMMUN REACTIONS)
Estimated infectious doses of agents

- **ESCHERICHIA coli**
- enteropathogenic $10^6$–$10^{10}$
- enterotoxigenic $10^6$–$10^8$
- enteroinvasive $10^8$
- enterohaemorrhagic $10^1$–$10^3$
- Shigella $101$–$102$
- Salmonella Typhi $<10^3$
- Other salmonellae $10^5$-$10^7$
- but:
  - Salmonella Newport 60 – 230 in hamburger
  - Salmonella Eastbourne 10 – 25 in chocolate
  - Salmonella Heidelberg 100 – 500 in cheese
  - Clostridium perfringens $10^6$–$10^8$
  - Campylobacter 500
  - Vibrio cholerae $10^6$
  - Vibrio parahaemolyticus $10^5$–$10^7$
CLINICAL FORMS OF THE INFECTIOUS DISEASES
(BASED ON SYMPTOMS)

INAPPARENT OR SUBCLINIC INFECTION
- insufficient number of attacking germs
- low virulence of aggressors
- good immunostatus of macroorganism

ABORTIVE INFECTIONS:
- attenuated, characterless symptoms
- fast recovery

INFECTIONS WITH CLASSICAL SYMPTOMS
- determined time-intervals
- suitable, recognisable symptoms
- incubational (latent) period: from infection to first clinical signs
- prodromal period: aspecific, early symptoms
- classical, characteral symptoms appear
TIPICAL SYMPTOMS-RUBELLA
TYPICAL SYMPTOMS - TULARAEMIA
LIVER IN HEPATITIS B
CLINICAL COURSE, DURATION, APPEARANCE- FORMS OF COMMUNICABLE DISEASES:

HYPERACUTE (FULMINANT):
-complications may appear before classical symptoms
-for ex.: meningococcal-meningitis:
    adrenal-insufficiency
    with skin haemorrhages

ACUTE
-marked onset - marked end
-duration no more 6 week
-for ex.: chicken-pox, rubella

SEMI-ACUTE:
-marked onset - long-lasting duration,
    with more than 6 week
-for ex.: typhoid fever, tularaemia

CHRONIC:
-duration: years with exacerbations,
-for ex.: hepatitis B,C, Lyme-borreliosis, AIDS,
    TBC, syphilis
OUTCOMES:

RECOVERY

RECOVERY WITH COMPlications
- serious, but reparable alterations
  for ex.: meningococcal-infection: adrenocortical haemorrhage
  mumps: orchitis

RECOVERY WITH DEFECT
- permanent organic alterations
  for ex.: poliomyelitis: paralysis
  encephalitis: dysfunctional remains

RECOVERED WITH POST-DISEASE (SEQUELAE)
- after the recovery and passed an asymptomatic period
- appearance of a characteral non-communicable disease:
  for ex.: after 2 weeks the scarlet fever: glomerulonephritis, carditis

DEATH
COMMUNICABLE DISEASES BY ITS OCCURRENCE IN TIME:

SEASONALITY:
enormous, numerous occurrence of a disease in a given season:
for ex.:
- in winter: typhus exanthematicus
- in winter and spring: influenza
- autumn: meningococcal-infection
- in summer: enteral diseases, tick-born encephalitis

CYCLICITY:
- periodic, systematic recrudescence, return of a communicable disease in determined time-intervals
generally represented in increased occurrence
for ex.:
- diphtheria: by 12-13 years with stronger-expressed epidemics
- influenza: by 1-2 years,
- influenza pandemics: approx. 30 years
COMMUNICABLE DISEASES BY ITS OCCURRENCE IN SPACE

**sporadic**: scattered, dispersed cases of a communicable disease, without any connections in time and space for ex.: rabies, Lyme-borreliosis

**endemic**: permanently or long-lastingly increased presence of a disease in a given area for ex.: viral haemorrhagic fevers, malaria, sleeping sickness, yellow fever

**epidemic** definition is on the next slide for ex.: chicken pox, scarlatina, erythema infantum

**pandemic**: diffused spread of a communicable disease on the continents or Earth for ex.: cholera, influenza
EPIDEMIC

occurrence of some communicable disease-cases in a community or region (or outbreak) with a SIGNIFICANTLY, CLEARLY IN EXCESS OF NORMAL EXPECTANCY frequency

number of cases, indicating presence of an epidemic-vary-according to:
- infectious agent
- size and type of population exposed
- previous experience or lack of disease
- time and place of occurrence
- usual frequency of the disease in the same area-among specified population at the same season of year
REQUIRED IMMEDIATE REPORT

To the local and central health authority:

- two cases of the same disease, associated in time and space, notably in case of high-emergence communicable diseases
- are sufficient evidence of transmission to be considered EPIDEMIC

-a single case of a communicable disease long absent from a population
or having high emergence

- or the first invasion by a disease
OCCURRENCE OF COMMUNICABLE DISEASES

CUMULATION OF CASES:

MORE MASSIVE OCCURRENCE TO THE AVERAGE LEVEL
OF A GIVEN COMMUNICABLE DISEASE-CASES
IN A DETERMINED TIME AND SPACE

EPIDEMIC:

SIGNIFICANTLY MORE FREQUENT FROM THE EXPECTED OR FOUND ABOVE OF
A DETERMINED TRESHOLD LIMIT OCCURENCE
OF A GIVEN COMMUNICABLE DISEASE
Global epidemiology of communicable diseases

Most important recent communicable diseases

- MALARIA
- HIV/AIDS
- HEPATITIS B
- CHOLERA
- TETANUS
- TB (TB-MDR)
- EEC
- VIRAL HEMORRHAGIC FEVER
Leading causes of lost years of life in 2013

GLOBAL BURDEN OF DISEASE STUDY & THE LANCET, 2014
At least 38% caused by communicable diseases (mostly in developing countries)
Millennium Development Goals (MDGs)

To combat Malaria, HIV and other diseases is one of the Millennium Development Goals (MDGs) that were established following the Millennium Summit of the United Nations in 2000.

Target 6A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS
Target 6B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it
Target 6C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases
  - Prevalence and death rates associated with malaria
  - Proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs
  - Incidence, prevalence and death rates associated with tuberculosis
Malaria

Malaria is a life-threatening disease caused by parasites that are transmitted to people through the bites of infected mosquitoes.

In 2013, malaria caused an estimated 584,000 deaths, mostly among African children.

198 million cases of malaria in 2013.

Malaria mortality rates have fallen by 47% globally since 2000, and by 54% in the WHO African Region.
HIV-AIDS

Human Immunodeficiency Virus

- HIV-1 is more common worldwide (pandemic)
- HIV-2 is found in West Africa, Mozambique, and Angola

HIV-2 is less easily transmitted and less pathogenic

Transmission:
- Direct contact with infected blood
- Sexual contact: oral, anal, or vaginal
- Direct contact with semen or vaginal and cervical secretions
- HIV-infected mothers to infants during pregnancy, delivery, or breastfeeding
HIV-AIDS - Global situation and trends

Since 1981, almost 78 million people have been infected with the HIV virus and about 39 million people have died of HIV.

Globally, 35.0 million people were living with HIV at the end of 2013.

An estimated 0.8% of adults aged 15–49 years worldwide are living with HIV, although the burden of the epidemic continues to vary considerably between countries and regions.

Sub-Saharan Africa remains most severely affected, with nearly 1 in every 20 adults living with HIV and accounting for nearly 71% of the people living with HIV worldwide.
Change in AIDS trends in US

Stage 3 (AIDS) Classifications, Deaths, and Persons Living with HIV Infection Ever Classified as Stage 3 (AIDS) 1985–2010—United States and 6 Dependent Areas

Diagnoses and deaths, No. (in thousands)

Year of diagnosis or death

Note: All displayed data have been statistically adjusted to account for reporting delays, but not for incomplete reporting. Deaths of persons with HIV infection, stage 3 (AIDS) may be due to any cause.
Tuberculosis (TB)

- ranks as the second leading cause of death from a single infectious agent (after HIV)
- **9 million** new TB cases in 2013 (including 1.1 million cases among people living with HIV)
- In 2013, **1.5 million** people died from TB, including 360,000 among people who were HIV-positive.
- TB **mortality** rate has decreased 45% since 1990

![Graph showing estimated absolute numbers of TB cases and deaths](image)
Global trends in estimated rates of TB incidence, prevalence and mortality 1990–2013

Source: WHO Global tuberculosis report 2014
Estimated TB incidence rates, 2013

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: Global Tuberculosis Report 2014. WHO, 2014. © WHO 2014. All rights reserved.
Multidrug-resistant TB

- Drug-resistant TB emerges as a result of treatment mismanagement, and is passed from person to person in the same way as drug-sensitive TB.
- Multidrug-resistant TB (MDR-TB) is caused by bacteria that are resistant to the most effective anti-TB drugs (isoniazid and rifampicin). MDR-TB results from either primary infection or may develop in the course of a patient's treatment.
- Extensively drug-resistant TB (XDR-TB) is a form of TB caused by bacteria that are resistant to isoniazid and rifampicin (i.e. MDR-TB) as well as any fluoroquinolone and any of the second-line anti-TB injectable drugs (amikacin, kanamycin or capreomycin)