Imported diseases
In the past...

Plague in Europe in XIV century

Doctor
Now....
Infectious diseases mortality (WHO)

Figure 2: Leading causes of death worldwide. About 15 million (>25%) of 57 million annual deaths worldwide are the direct result of infectious disease. Figures published by the World Health Organization (see http://www.who.int/whr/en and ref. 7).
New and emerging diseases

§*Emerging*

infectious diseases caused by newly discovered agents

§ *Re-emerging*

already known diseases with higher incidence than in the past, or diseases that re-emerged
Emerging diseases

- Known agent causes infection in a new host
- New infectious agent causes new disease - SARS
- New agent causes known disease - avian fly
- Presence of more severe forms of disease that were not present in the past
Re-emerging

- Higher incidence
- Change in geographical distribution of disease
- Emergence of resistant or multiresistant infectious agents
Factors contributing to emergence and re-emergence of diseases

1. Demographic and behavioral factors

Ø population density
Ø risky sexual behavior (HIV, STDs)
Ø drug abuse (HIV, hepatitis C)
Ø Changes in nutrition: international cuisines (food borne diseases)
Ø Increase of immunosuppressed patients: older age, HIV/AIDS, malignances, antibiotic and other drug consumption
Factors contributing to emergence and re-emergence of diseases

2. Technology and industrialization
   Ø mass food production
   Ø antibiotic usage in flood industry
   Ø In medicine: longer life span (IK)

3. Economic development, ecosystem changes
   Ø Exposure to wild animals and vectors (lyme disease....)
   Ø ecosystem changes due to industrialization
Factors contributing to emergence and re-emergence of diseases

4. International travel and commerce
   Ø Possibility of transmission higher – air traffic
   Ø Food importation etc - possible route of pathogen transmission

5. Adaptation and change of microorganisms
   Ø Emergence and spread of resistance – consequence of broad antibiotic consumption
   Ø Increased virulence
   Ø Changing of host – (form animals to humans)
Factors contributing to emergence and re-emergence of diseases

6. Non compliance of preventive measures

Ø Lack of surveillance of infectious agents
Ø Inadequate notification of infectious diseases
Ø Infrastructure: water supply, drainage....
Ø Inadequate or lack of vaccine programs
Ø Vector control
Additional factors contributing to the emergence of diseases in new millennium

7. Climate changes
8. Poverty
9. Wars and famine
10. Biological warfare
Imported diseases

Diseases not autochthonous in geographical region

and/or

diseases caused by strains of microorganisms that are not autochthonous in a certain region
Tourism - risk of infections

• Depends of a destination

• Tropics and subtropical regions
  - most frequent sources of diseases (underdeveloped countries, climate, endemic diseases)
  - 22 - 64% of travelers from tropical regions experience some health problems caused by infectious agents (data from USA)

• Developed countries – the source of multiresistant pathogens, diarrheal diseases (ETEC, EHEC....) and less frequently other diseases
Risk factors for imported diseases

INGESTION

• **Water**
  hepatitis A i E, *Salmonella*, *Shigella*, Giardia, poliomyelitis, amoebiasis, cryptosporidiosis, cholera, typhoid fever

• **Unpasteurised dairy products**
  brucellosis, *Salmonella*, *Shigella*, *Listeria monocytogenes*, Q fever

• **Undercooked food**
  *Salmonella*, *Shigella*, E.coli, *Campylobacter*, trichinelosis, helminthiasis, amoebiasis, toxoplasmosis
ENVIRONMENT

- **Water** – leptospirosis, shistosomiasis, Acanthamoeba, Naegleria spp.
- **Soil** – anthrax, helminthiasis, cutaneous larva migrans
- **Air** – influenza, morbilli, tuberculosis
- **Sexual contact** – HIV, hepatitis B and C, sifilis, gonorrhea, herpes
- **i.v. drug users/blood transfusion** – HIV, hepatitis B and C, malaria, toxoplasmosis, babesiosis
- **Contact with infected persons** – TB, EBV, meningitis, lassa, pneumonia
VECTOR EXPOSURE

- **Mosquitos** – malaria, dengue fever, yellow fever, encephalitis, filariasis
- **Lice** – epidemic typhus, febris reccurens, trench fever
- **Fleas** – pest, murine typhus
- **Ticks** – lyme disease, babesiosis, erlichiosis, rickettsiosis, encefalitis, Q fever, tulareemia, Crim-Congo hemorrhagic fever
- **Mites** – scrub typhus, scabies
- **Sandflies** – laishmaniasis, bartonnelosisis, filariosis
- **Flies, etc** – tryipanosomiasis, onchocercosis
ANIMAL CONTACT

- **Direct contact** – anthrax, rabies, Q fever, typhoid fever, tularemia, brucellosis, leptospirosis, echinococcosis

- **Exposure to excretions of animals** – Lassa fever, hantaviruses, leptospirosis

- **Contact with animal products** - anthrax
Risk of infections in travelers

- **High:**
  - Ø viral diarrhea
  - Ø *E.coli* enteritis
  - Ø respiratory infections

- **Moderate:**
  - Ø malaria (without prophylaxis)
  - Ø *Salmonella, Shigella, Campylobacter*
  - Ø *Giardia, Amoeba, hepatitis A*
  - Ø dengue, EBV
  - Ø gonorrhea, *C. trachomatis, HSV*


Risk of infections in travelers

- **Low:**
  - Ø malaria (with prophylaxis)
  - Ø TB, rickettsial diseases, leptospirosis, typhoid, cholera, lyme
  - Ø HIV, HBV, sifilis
  - Ø shistosomiasis, helminthiosis, morbilli

- **Very low:**
  - Ø anthrax, pest, hemorrhagic fevers, tularemia
  - Ø yellow fever, rabies, poliomielitis
  - Ø legionelosis, diphtheria
  - Ø trypanosomiasis, trichinellosis, filariosis, toxocariasis, echinococcosis
Emerging bacterial diseases

• Resistant and multiresistant bacteria

  *Staphylococcus aureus:*
  – MRSA
  – VISA (vancomycin intermediate *S.aureus*)
  – VRSA (vancomycin resistant *S.aureus*)

  **Coagulase negative staphylococci**

  *(CoNS)*

  – MRCoNS – methicillin resistant CoNS
**Enterococcus** spp.:
- VRE – vancomycin resistant enterococci
- HLAR – high level amynoglicoside resistance
- Penicillin resistance

**Streptococcus pneumoniae:**
- PRP – penicillin resistant pneumococcus
- NSPS – non penicillin susceptible pneumococcus
- MDRP – multi resistant (macrolides, fluorohinolones.....)
Enterobacteriaceae

– ESBL (extended spectrum beta lactamases)
  
  *plasmid beta lactamases that induce resistance to all beta lactams except carbapenems (therapy of choice), produced by E.coli, K.pneumoniae, P.mirabilis etc.*

– Aminoglycoside resistance

– Fluorohinolone resistance
Non fermentors

– MBL (metalo beta lactamases)  
  *resistance to all beta lactams except monobactams*

– *Acinetobacter* spp. – multiresistance
– panresistance

**Other resistant pathogens**

– pathogenic neisseria, *H.influenzae*...
Emerging bacterial diseases

- tuberculosis
  - ↑ in number of cases
  - ↑ of resistant clones - MDR TB (multi drug resistant TB)
  - Sinergy with HIV

Emerging and re-emerging bacterial diseases

- Diarrheal diseases
  
  **E. coli** (EHEC)
  
  - The most frequent agent of HUS and bloody diarrhea in developed countries

  **Salmonella**
  
  - Europe: *Salmonella* serotyp Enteritidis dominant

  **Campylobacter** spp.
  
  - Worldwide distribution

  **Vibrio cholerae**
  
  - Higher incidence in endemic regions, possibility of importation
• Diseases caused by *Streptococcus pyogenes*-om
  – higher incidence, and emerging of severe life threatening forms
• Legionnaire disease
• Meningococcal diseases (vaccine)
• Lyme disease
• Diphteria
  – reemergence after vaccine withdraw– Russia
• many others........
New viral diseases

Ø Lassa (1966)
Ø Marburg & Ebola hemorrhagic fevers (1967, 1977)
Ø AIDS (1983)
Ø Hepatitis C (1989)
Ø Hantavirus infections (HFRS 1976, HPS 1993)
Ø Avian Influenca (1997)
Ø Nipah encephalitis (1998)
Ø SARS (2003)
Reemerging viral diseases

Re-emerging

Ø Dengue
Ø Yellow fever
Ø Rift Valley fever
Ø rabies
Ø West Nile encephalitis
Ø Crim-Congo hemorrhagic fever
Ø Tick borne encephalitis
2003 - Severe acute respiratory syndrome (SARS)
SARS

- SARS Corona virus (*Coronaviridae*)
- Mortality high in older individuals (age over 60)
- Transmission:
  - direct contact
  - respiratory droplets
  - fecal oral route (!?!)  

*Diagnosis*

- PCR, IF, isolation in cell culture
Influenza

Pandemic in XX century
recombinant avian fly and human fly virus

1918 – H1N1
1957 – H2N2 (Asian fly)
1968 – H3N2 (Hong Kong)
1977 – H1N1 (Russian fly)
Influenza
Influenza

1997 (Hong Kong)
– first cases of avian influenza in humans (H5N1)
**Influenca**

**Avian influenza**

- Clinical symptoms: pneumonia, acute respiratory distress syndrome
- Transmission:
  - contact with infected birds
  - respiratory droplets (infected human)

**Diagnosis**

- PCR, isolation, IF

**Prevention**

- control, early diagnosis, vaccine
1. **Togaviridae** (eastern equine encephalitis, west equine encephalitis, venecuelan equine encephalitis viruses)

2. **Flaviviridae** (Yellow fever, Denge, West Nile encephalitis, Tick borne encephalitis)

3. **Bunyaviridae** (Crim- Congo hemorrhagic fever, Rift Valley fever)
Arboviral infections

Clinical signs

Ø Fever and rash
Ø Encephalitis
Ø Hemorrhagic fever

Diagnosis

- Serology- IgM antibodies
- Viral detection – PCR, IF, isolation in cell culture etc. (BSL 3 i 4)
Arboviral infections in Europe (Serbia !?!)  

Denge (Denge hemorrhagic fever)  

Reservoir primates - monkeys  
Transmission: mosquitoes  

*In Europe  
(Greece, 1927-28)
Viral zoonosis

Definition:

Diseases of animals that can be transmitted to humans

Transmission:

1. Direct – rabies, LCMV, lassa, ebola & marburg, hantavirus

2. Indirect (through vector) - arboviruses
Rabies

Rabies (Rhabdoviridae)
Ø Acute fatal encephalitis
Ø Reservoir: bats, animals
Ø transmission:
   - animal bite
   - aerosol
   - transplantation

diagnosis
- viral detection: PCR, IF, isolation
- Serology: ELISA
Haantan viral diseases

Hantaan viruses (*Bunyaviridae*)

Ø Hemorrhagic fever with renal syndroma (HFRS)

* Vojvodina, Bosna, Južna Srbija

Ø Reservoir: rodents

Ø Transmission: contact with excreta of infected rodents

**Diagnosis**

- Viral detection: PCR, IF, isolation
- Serology: ELISA
Cyclospora spp.

Epidemiology: contaminated fruits (raspberry) and vegetables, water
Clinical signs: diarrhea
Diagnosis: oocysts in stool
Therapy: Bactrim® (trimetoprim-sulphametoxasol)
Cryptosporidium parvum

**Reservoir:** humans, mammals, reptiles, birds, fish

**Epidemiology:** ingestion of **oocysts** from human or animal feces – water, food, hands
- persistence in feces after 6 month, susceptible to higher T (+60°C destroys and freezing for 30 min)

**Clinical signs:** diarrhea

**Therapy:** symptomatic
Fungal infections

- *Candida* spp.
- *Aspergillus* spp.
- *Penicillium* spp.
- *Pneumocystis jiroveci*
- zygomycosis
- aphlatoxin
- resistance to antimicotics
PLASMODIUM SPP.

- *Plasmodium falciparum*
- *Plasmodium vivax*
- *Plasmodium malariae*
- *Plasmodium ovale*

- MALARIA (*paludismus* – Latin: *palus* = moss, moss fever)

- Vector – *Anopheles* spp.

- ABOUT 270 MILLION PEOPLE SUFFERS FROM MALARIA, AND AROUND 2.5 MILLION DIES ANNUALY, 3.2 Billion people are at risk of malaria

- *P. falciparum* & *P. vivax* - 95% INFECTION
Malaria – Cycle

MALARIJA – ROUT OF TRANSMISSION

Through vector

blood transfusion
contaminated needles
from mother to child
MALARIA

• More than 80 species of Anopheles are potential vectors of Plasmodium
• In ex Yugoslavia 7 species are endemic
  A. maculipenis, A. superpictus, A. bifurcatus, A. algeriensis, A. plumbeus, A. sacharovi i A. hyrcanus

• Clinical signs

Attacks of malaria are characterized by PROGRESSIVE ANEMIA AND SPLENOMEGALIA

ATTACKS IS CHARACTERISED BY PAROXSYSMS AND SHORTER OR LONGER AFEBRILE PERIODS
MALARIA

- **PAROXYMS** are developing due to simultaneous rupture of infected erythrocytes

- Paroxysm commences clinically with **fever** (few hours), accompanied with **afebrile stage** (t° type continua, > 40°C, lasting for few hours), ending with **sudden drop of temperature** (crisis)
Er infected by *P. falciparum* with knobs on the surface
MALARIA /DIAGNOSIS

Clinical signs
Specific diagnosis
• PRESENCE OF PARASYTE
• SEROLOGY
• PCR

MATERIAL for diagnosis:

• BLOOD
• PUNCTATES (BONE MARROW OR LIVER ON SPECIAL OCCASION)
• TOUCH PREPARATION OF PLACENTA
• PATHOHISTOLOGY OF TISSUE BIOPSIES

BLOOD: is used for THIN and TICK slide

Blood samples should be taken as frequent as possible, usually 3 consecutive days in the morning and in the evening!!!
MALARIA – PROBLEMS!

- Resistance to antimalaric agents
- Resistance of vectors to insecticides
- Lack of vaccine
- Imported malaria