

Infectious diseases

- **1. Bacteria**
- 2. Viruses
- 3. Mycetes (Fungi)
- 4. Parasites

1. Bacterial infections

- **toxemia** = toxins in blood circulation
- alimentary
 - botulotoxin (*Cl. botulinum*)
 - enterotoxin (*Staphylococci*)
- wound
 - tetanotoxin (*Cl. tetani*)
- other
 - diphtheratoxin (*C. diphtheriae*)
- regressive changes (liver, kidney, heart)

Bacterial infections

- **bacteremia** = bacteria in blood circulation
- time-limited
- elimination by immune system
- e.g.: digestion, tooth extraction, tonsillectomy, catheter, cystoscopy...

!!! heart valves defect → infective endocarditis → ATB cover !!!

Bacterial infections

- **sepsis** = bacteria > immune system
- fever + splenomegaly + lymphadenopathy
- *streptococci, staphylococci*

- **metastasizing sepsis** (septicemia)
- nasopharynx → meninges (*N. meningitidis*)
- pulmonary abscess → brain abscess
- furuncle → bones + kidney (*Staphylococci*)

Bacterial infections

- **pyemia** (septicopyemia) = thrombi + bacteria in blood circulation
- sequela: septic infarction → metastatic abscess
- 1. central – infective endocarditis
→ brain, kidney, skin, ...
- 2. peripheral – purulent thrombophlebitis (p.t.)
→ lungs
- 3. portal – p. t. of portal vein branch
→ liver
- 4 . umbilical – p.t. of umbilical vein (newborn)

Staphylococci

- Gram+, common
- normally on skin + mucosa
- skin abscesses x sepsis
- nosocomial infections
- secondary infections (influenza)
- *Staph. aureus* + *Staph. epidermidis*

Staphylococci

- 1. skin lesions (wounds)
 - furuncle → carbuncle (DM)
 - impetigo
 - panaritium
- 2. mastitis (breast feeding woman)
- 3. osteomyelitis + arthritis
- 4. enterocolitis + alimentary enterotoxiosis
- 5. acute infective endocarditis
- 6. toxic shock syndrome

Streptococci

- Gram+, common
- β-hemolytic (A-D, G)
 - *Str. pyogenes* (A)
 - *Str. agalactiae* (B) – mother's vagina → newborn's meningitis
- α-viridans (H)
 - subacute infective endocarditis
 - *Str. mutans* – caries, pulpitis
- *anaerobic (Peptostreptococci)* – oral cavity

Streptococci

- *Str. pyogenes* (A)
- 1. local inf. – phlegmone, impetigo, wound inf.
- 2. angina (tonsillitis) → otitis, sinusitis
- 3. scarlet fever (erythrogenic toxin)
 - angina + oral enanthema (raspberry tongue) + skin exanthema (face, trunk)
- 4. erysipelas
 - skin erythema (lower limbs, face) + toxemia
 - lymphatic + blood vein thrombosis → lymphostasis → edema → elephantiasis

Streptococci

- sequelae (*Streptococcus A*)
 - M protein
 - cross reaction (immune)
 - **acute glomerulonephritis**
 - **rheumatic fever**

Pneumococci

- *Str. pneumoniae*
- Gram+ diplococci
- Children - rhinitis, nasopharyngitis, sinusitis, otitis
- Adults - lobar pneumonia → meningitis

Neisseria

- Gram- diplococci
- *N. meningitidis*
- sporadic x endemic
- children, young adults, soldiers
- nasopharynx → meninges
- **!!! rapid course → death (hours) !!!**
- meningeal syndrom + skin purpura + DIC
- **Waterhouse-Fridrichsen syndrome**
 - meningococcal sepsis + DIC + bleeding in adrenals (insufficiency)

Neisseria

- *N. gonorrhoeae*
- gonorrhoea – STD
- purulent inflammation + discharge
- M: urethritis → prostate, vesicles
- F: kolpitis, cervicitis → endometritis → salpingo-oophoritis → sterility
- distant complication: arthritis (knee)

Escherichia coli

- Gram- rod
- normal in colon x other location - pathogenic
- *enteropatogenic* – diarrhoea (newborn)
- *enteroinvasive* – diarrhoea (adults)
- *enterotoxigenic* – travellers' diarrhoea
- *enterohemorrhagic* - verotoxin
 - hemorrhagic colitis
 - hemolytic-uremic syndrome (children)

Salmonella

- *S. typhi* – typhoid fever
- food → bowel → liver → gallbladder → bowel
- ileum
- 1. hyperplasia of RES in ileum – typhoid cells
- 2. mucosal necroses upon Peyer patches
- 3. ulcerations
- 4. reparation → scar
- complications
 - bowel perforation/hemorrhage
 - chronic carriage (gallbladder)

Salmonella

- *S. paratyphi* – paratyphoid fever
- *S. enteritidis, S. typhimurium*
- gastroenteritis + enterocolitis
- alimentary
- vomiting + diarrhoea

Shigella

S. dysenteriae, S. sonnei, S. flexneri

bacillar dysentery

„dirty hands“ + alimentary

hemorrhagic colitis + ulcers + pseudomembranes

Campylobacter + Helicobacter

- *Campylobacter jejuni*
- infants
- diarrhoea
- *Helicobacter pylori*
- asymptomatic
- etiology of:
 - chronic gastritis
 - peptic ulcer of stomach and duodenum
 - gastric carcinoma
 - gastric MALT-lymphoma

Vibrio

- *V. cholerae* – cholera
- water, food, ill man
- massive watery diarrhoea (15 l) !!!
- **NO** inflammation x enterotoxin
- dehydration → collapse
- **cholera nostras** - enterotoxins

Klebsiella

- *K. pneumoniae*
- pneumonia
- lung + liver abscesses

- *K. rhinoscleromatis*
- ulcerations of upper airways

Haemophilus

- *H. influenzae*
 - superinfection of viral infections
 - children – **epiglottitis**, meningitis, pneumonia
 - adults - otitis, sinusitis, bronchitis
- *H. ducreyi*
 - **ulcus molle (chancroid, soft chancre) - STD**

Corynebacterium

- *C. diphtheriae* – diphtheria
- children
- pseudomembranous tonsillitis + laryngitis
- airway obstruction
- diphtheratoxin - myocarditis

Bordetella

- *B. pertussis* – whooping cough
- children
- acute inflammation of upper airways
- cough + vomiting + face edema

Pseudomonas

- *P. aeruginosa*
- colonization of respiratory and urinary tract
- immunocompromised patients
- plastic, catheters
- serious nosocomial infection
- pneumonia, meningitis,

Bacillus

- *B. anthracis* – anthrax
- animal products + dust
- hemorrhagic necrotising lesions
- skin – *pustula maligna*
- lungs, GIT, ...

Yersinia

- *Y. pestis* - plague
- rodents → rats → flea (*Xenopsylla cheopis*) → man
- *bubonic plague*
 - skin bite → LN (groin) → hemorrhagic necrosis (black color) + fistulas
- *pneumonic plague*
 - lung abscesses
- ↑ mortality
- WHO report

Yersinia

- *Y. pseudotuberculosis*, *Y. enterocolitica* – *lymphadenitis mesenterialis*
- children, ~ appendicitis
- alimentary
- bowel → mesenteric LN
- operation: normal app. + enlarged LN
- purulent granulomatous inflammation

Francisella

- *F. tularensis* - **tularemia** (hare disease)
- rodents → man
- regional LN – hemorrhagic necrosis + granulomatous inflammation
- ulceroglandular – most common, skin wound
- oculoglandular - conjunctiva
- typhoid – sepsis
- pneumonic

Legionella

- *L. pneumophila*
- water
- flu-like x pneumonia
- complications
 - pancarditis
 - skin + liver abscesses

Spirochetes

Treponema pallidum – syphilis (lues)

Clostridium

- *Cl. tetani* – tetanus
- wound → toxins (blood, nerves) → spinal cord → spasms of striated muscles (necroses)
- risus sardonicus + opisthotonus
- 10-50% mortality
- *Cl. botulinum* - botulism
- meal from tins (toxin)
- visual disturbances, muscle paralysis → respiratory insufficiency + arrhythmias → **death**

Borrelia

- *B. recurrentis* – febris recurrens
- ill man → louse → infection
- mucosal hemorrhages + microabscesses
- liver + spleen necroses

- *B. burgdorferi* – Lyme disease
- rodents → tick (*Ixodes*) → man
- 1. erythema migrans (skin)
- 2. multiple EM + CNS + heart + joints
- 3. acrodermatitis chronica atrophicans + CNS

Mycobacterium

- *M. tuberculosis* – TBC
- *M. leprae* – **leprosy**
- atypical mycobacteria
- *M. kansasii*, *M. xenopi*, *M. intracellulare-avium*
- TBC ~ pneumonia
- in AIDS patients

Actinomyces

- *A. izraelii* – actinomycosis
- normal in oral cavity
- firm infl. infiltrate → fibrosis (scar) → fistulas
- 1. cervicofacial – most common
- 2. thoracic – lung abscesses
- 3. abdominal – IUD → salphingo-oophoritis
- Mi: pus + act. colonies + Hoeppli-Splendore phenomenon

Mycoplasma

- NO cellular wall
- children + young adults
- *M. pneumoniae*
 - pneumonia, otitis, sinusitis
- *M. hominis*
 - non-gonococcal urethritis
- *Ureaplasma urealyticum*
 - non-gonococcal urethritis

Rickettsia

- intracellular
- *R. prowazeki* – **spotted fever** (typhus exanthematicus)
- ill man → louse (*Pediculus h. corporis*) → skin wound
- endothelium (+ vasculitis) → blood circulation
- skin exanthema + petechiae
- encephalitis + myocarditis
- ↑ mortality (20-70%)
- recurrence (20 years) – **Brill-Zinser disease** (LN)

Rickettsia

- *R. rickettsii* – Rocky Mountain fever
- tick (*Dermacentor*)
- *Coxiella burnetii* - Q fever
- Australia
- animal milk, dust inbreathing
- atypical pneumonia
- liver + bone granulomas

Chlamydia

- *Chl. trachomatis* (A, B, C) - trachoma
- contagious keratoconjunctivitis
- hypertrophic conjunctivitis → pannus over cornea → **blindness**
- *Chl. trachomatis* (D-K) - urethritis
- Reiter syndrome: urethritis + arthritis + conjunctivitis
- *Chl. pneumoniae* (TWAR) — atypical pneumonia

2. Viruses Infectious diseases

- intracellular
- DNA or RNA
- cytopatogenic effect
- inclusions
 - intranuclear (IN)
 - intracytoplasmic (IC)

DNA viruses

- 1. *Poxvirus*
- 2. *Herpesvirus*
- 3. *Adenovirus* — pneumonia, ep. keratoconjunctivitis
- 4. *Papovavirus*
- 5. *Parvovirus* — erythema infectiosum
- 6. *Hepadnavirus* — HBV (Dane's part.) - hepatitis B

Poxviridae

- 1. Variola (smallpox)
- E. Jenner - vaccination
- world-wide eradication
- ill man → air droplets
- skin: macula → papula → pustula → scar (face)
- IC - Guarnieri bodies
- generalization → necroses (liver, spleen, kidney..)
- ↑ mortality

Poxviridae

- 2. Vaccinia (cows)
- 3. Molluscum contagiosum
- common
- children
- skin firm papules + central pit
- IC mollusca bodies

Herpesviridae

- 1. *Herpes simplex virus* - HSV1, HSV2
- 2. *Varicella-zoster virus* - VZV
- 3. *Epstein-Barr virus* - EBV
- 4. *Cytomegalovirus* - CMV
- 5. *HHV8 (KSV)* – Kaposi sarcoma

Herpes simplex virus

- epidermotropism + neurotropism
- intraepithelial blister + IN eos. inclusions (Lipschutz)
- *HSV1* – oral (kissing)
 - primary – h. gingivostomatitis (lips, vestibulum)
 - reactivation – h. labialis
- *HSV2* – genital, perianal (STD)
 - M: balanoposthitis, proctitis
 - F: vulvitis, cervicitis, proctitis
 - newborn infection (delivery)
- complications: esophagitis, hepatitis, encephalitis

Varicella-zoster virus

- 1. Varicella (chickenpox)
- contagious febrile disease
- children
- skin + mucosa: small blisters → ulcers
- complication
 - interstitial pneumonia
 - encephalitis

Varicella-zoster virus

- 2. Herpes zoster (shingles)
- adults
- reactivation from sensitive nerve ganglia
- unilateral !!!
- painfull blisters in dermatoma of one nerve
 - trunk - intercostal nn.
 - face – n. V – h.z. ophthalmicus – keratitis
- complication: paresthesias

Epstein-Barr virus

- **1. Infectious mononucleosis**
 - kissing disease, children
 - acute fever + RES
 - tonsils (pseudomembranous a.) + LN + splenomegaly (rupture!) + liver (hepatitis)
 - blood: lymphocytosis + atypical lymphocytes
- **2. Burkitt lymphoma** (Africa – jaws)
- **3. Extranodal NK/T-cell lymphoma, nasal type**
- **4. Hodgkin's lymphoma** (probably)
- **5. Lymphoepithelial carcinoma** (nasopharynx)

Cytomegalovirus

- infectious saliva, blood, urine, milk, STD
- IN bas. inclusions („owl eye“)
- asymptomatic
- fetus
 - brain (microcephaly, hydrocephalus, calcifications)
 - ear, eye, liver, blood marrow, kidney, salivary glands
- adults – AIDS, immunosupresion

Papovaviridae

– Human Papilloma Viruses

(HPV)

- affinity to squamous epithelium
- oncogenic effect
- koilocytes (perinuclear halo)
- low risk – 6, 11
 - warts, condyloma acuminatum (STD)
 - oral + laryngeal papillomas
- high risk – 16, 18, 31
 - cervical, vaginal, vulvar, perianal carcinomas !!! – STD
 - squamous cell carcinoma of oropharynx

RNA viruses

- 1. *Orthomyxovirus*
- 2. *Paramyxovirus*
- 3. *Rhabdovirus*
- 4. *Retrovirus* – HIV - AIDS
- 5. *Arenavirus*
- 6. *Coronavirus*
- 7. *Bunyavirus*
- 8. *Reovirus*
- 9. *Togavirus*
- 10. *Picornavirus*

Orthomyxoviridae

- influenza (flu)
- ↑ infectious febrile d.
- epidemic
- acute onset, fever, general symptoms
- pharyngitis + hemorrhagic tracheitis
- complications
 - atypical pneumonia
 - bacterial superinfections (*H. influenzae*)

Paramyxoviridae

- *respiratory syncytial virus*
- infants
 - atypical pneumonia (Adams p.)
 - bronchiolitis obliterans
- adults
 - upper airways infection

Paramyxoviridae

- morbilli (measles)
- ↑ infectious exanthematous d., children
- 1st stage – flu-like, Koplik's spots (cheek)
- 2nd stage – skin exanthema
- + RES (LN, tonsils, spleen, appendix)
- **Warthin-Finkelday** giant multinucleated cells
- complications
 - atypical pneumonia
 - encephalitis
 - acute postinfective
 - subacute sclerosing panencephalitis (late)

Paramyxoviridae

- parotitis epidemica (mumps)
- acute flu-like d. + SG swelling, children
- unilateral x bilateral, painful
- ↑ parotis + ..
- complications
 - orchitis + oophoritis (sterility)
 - pancreatitis
 - meningoencephalitis

Rhabdoviridae

- lyssa (rabies)
- animal (dog, fox) saliva → bite → along nerves → CNS
- neurons (cornu Amonis) – IC Negri bodies
- hydrophobia, muscle spasms, furiousity, psychic alterations
- **!!! always lethal !!!**

Arboviridae

- = **AR**thropode **BO**rn
- **1. encephalitis**
- transmission by insects (mosquito, tick (*Ixodes ricinus*))
- geographic distribution
- blood → CNS (basal ganglia, cerebellum)
- perivascular lymphocytic infl.
- flu-like → CNS disorders
- **2. febris flava (yellow fever)** – America, Africa
- liver necroses

Picornaviridae

- *1. Enteroviruses*
 - *Polioviruses*
 - *Coxsackie-viruses*
 - *Echoviruses* – flu-like d.
- *2. Rhinoviruses*
- coryza (common cold) – purulent rhinitis
- stomatitis **epizootica** (foot and mouth disease)
 - stomatitis + small blisters and **ulcers**

Polioviruses

- poliomyelitis anterior acuta
- acute febrile d., children
- direct contact, water
- CNS - necrosis of motoneurons of anterior horns of spinal cord
- muscle paresis, paralyses (lower limbs)
- neurogenic atrophy

Coxsackie - viruses

- epidemic d., children
- herpangina – pharyngitis
- myocarditis
- meningitis
- polymyositis

Viral hepatitis

Hepatitis	Virus	Transmission	Chronicity	Carriage	Fulminant
A	RNA	fecal-oral	NO	NO	0.4%
B	DNA	parenteral	5-10%	1%	1%
C	RNA	parenteral	80%	1%	rare
D	RNA	parenteral	5% co 80% super	10%	4% co-i.
E	RNA	fecal-oral	NO	NO	20% pregnant

3. *Mycetes* Infectious diseases

- **1. Mycoses**
 - true infectious diseases
- **2. Mycotoxicoses**
 - poisoning by fungal toxins – liver necroses
- **3. Mycoallergoses**
 - allergic reaction to fungal products
- **4. Mycetism**
 - local inflammation by fungi

Mycoses

- normal saprophytes in man
- immunosuppression – opportunistic infection
- endogenous
- purulent, granulomatous infl.
- superficial m.
 - skin + mucosa
- deep m.
 - organ involvement + systemic infection

Superficial mycoses

- = dermatophytoses
- *Trichophyton, Microsporum, Epidermophyton*
- limited to epidermis (scales) + skin adnexa
- **Tinea capitis, T. barbae, T. corporis, T. pedis et manus, T. unguium** (nails)
- **Pityriasis versicolor** (*Malassezia furfur*)

Deep mycoses

- *candidosis*
- *aspergillosis*
- *cryptococcosis*
- *pneumocystosis*
- *mucormycosis* – pneumonias, rhinocerebral inf.
- *histoplasmosis* – *H. capsulatum* - ~ TBC
- *blastomycosis, coccidioidomycosis*

Candidosis

- *C. albicans* – normal in oral cavity
- hyphae (non-branching) + blastospores
- **soor (moniliasis, trush)**
- pseudomembranous inflammation
- stomatitis, esophagitis, vulvitis, colpitis
- hematogenous dissemination

Aspergillosis

- *A. niger, A. flavus, A. fumigatus*
- branching hyphae (“Y”)
- aflatoxins (hepatotoxic, carcinogenic)
- angiotropism
- necrotising pneumonia
- aspergilloma - in bronchiectasias, TBC cavernae
- paranasal sinuses → brain

Cryptococcosis

- *C. neoformans*
- gelatinous capsule
- birds (pigeons) → dust → inhale
- granulomatous pneumonia
- granulomatous meningoencephalitis

Pneumocystosis

- *P. carinii/jiroveci*
- infants + AIDS patients
- interstitial pneumonia + alveoli fulfilled by grayish foamy mass

4. *Parasites* Infectious diseases

- 1. *Protozoa*
- 2. *Helminths*
- 3. *Arthropodes*

4.1. Protozoa

Trichomoniasis

- *T. vaginalis*
- STD
- urogenital tract
- F: colpitis - purulent discharge
- M: asymptomatic

Toxoplasmosis

- *T. gondii*
- contact with infected animal (cat) + a. products
- transplacentally
- 1. congenital form
 - abortus
 - hydrocephalus, microphthalmia, chorioretinitis, brain cysts, calcifications (Sabin triad)
- 2. acquired form
 - lymphadenitis (Piringer-Kuchynka)
 - B- and T- zone hyperplasia + tiny epithelioid granulomas

Trypanosomiasis

- *T. brucei gambiense*, *T. b. rhodesiense* – sleeping sickness
- Africa
- transmission - fly *Tse-tse* (*Glossina*)
- chronic meningoencephalitis – coma – death
- *T. cruzi* – Chagas disease
- America
- transmission – flatworm (*Triatoma*)
- myocarditis

Leishmaniasis

- transmission by sandfly
- *L. tropica* - skin f.
- „tropical sore“ – spontaneous regress
- *L. donovani* - visceral f.
- „kala-azar“ (black fever)
- RES – LN + hepatosplenomegaly

Amoebiasis

- *Entamoeba histolytica*
- food + water
- **amoebic dysentery**
- blood stools + diarrhoea + fever
- ulcers (~ bottle) in colon (caecum)
- complication
 - portal v. → liver - abscesses

Lambliasis

- *L. (Giardia) intestinalis*
- food + water
- chronic enteritis (small bowel) – diarrhoea
- anemia

Malaria

- !!! most important and serious tropics d.!!!
- *Plasmodium*
- **M. tertiana** (*P. vivax*, *P. ovale*)
- **M. quartana** (*P. malariae*)
- **M. tropica** (jungle fever) (*P. falciparum*)
- 1 mil death annually
- transmission – *Anopheles*

Malaria

- hepatocytes → erythrocytes → breakdown
- fever attack + shivering
- hemolytic anemia
- RES: hepatosplenomegaly + brownblack malaric pigmentum

4.2. *Helminths*

Enterobiasis

- *E. vermicularis* (pinworm, seatworm)
- most common, children
- small bowel → large bowel → anus (eggs)
- pruritus
- *appendicopathia oxyurica*
- complication
 - infection of genitals in girls (scribbling)

Trichinosis (Trichinelliasis)

- *T. spiralis*
- pork → bowel wall → blood → striated muscles → bot encapsulation
- eye-moving, masticatory, tongue, diaphragm, heart, ...
- surrounding inflammation

Ascariasis

- *A. lumbricoides*
- common, children
- food → bowel wall → blood → lungs → cough → pharynx → bowel
- complication
 - ileus, pneumonia

Taeniasis + Echinococcosis

- tapeworms
- *T. saginata*, *T. solium* (cysticercosis)
- food → bowel → muscles, CNS (rare)
- *E. granulosus*
- dogs
- bowel wall → liver → cysts – calcification + rupture

Schistosomiasis (Bilharziasis)

- flukes (trematodes)
- *Sch. mansoni*
- water (bathing)
- liver granulomas, liver fibrosis → cirrhosis
- *Sch. haematobium*
- urinary bladder → chronic cystitis → carcinoma ?
- haematuria

4.3. Arthropodes

Scabies

- *Sarcoptes scabiei* (mite)
- wars
- clothes, STD
- skin corridors → eggs
- interdigital spaces, genitals
- pruritus → scribbling → secondary infection

Sexually transmitted diseases (STD)

- **1. Bacteria**

- *Neisseria gonorrhoeae* - gonorrhoea
- *Treponema pallidum* - syphilis
- *Haemophilus ducreyi* – chancroid
- *Chlamydia trachomatis* – lymphogranuloma venereum
- *Calymnatobacterium granulomatis* – granuloma inguinale

- **2. Viruses**

- *HSV* - herpes
- *HBV* – hepatitis B
- *HPV* – condyloma acuminatum + cervical cancer
- *HIV* - AIDS

- **3. Parasites**

- *Trichomonas vaginalis* – kolpitis (vaginitis)
- *Sarcoptes scabiei* - scabies