

PATHOLOGY of viral infections

IMPORTANT clinico-pathological groups:

- Viral hepatitis * VHA, B, C, D, E, F, G, H...
- Viral rashes (exanthemas) measles, rubella, VZV, 5., 6.
- Herpesviruses HSV1,2; VZV, EBV, CMV, HHV8
- Respiratory viral infections influ, parainflu, rhino+corona, RSV...
- Transforming viruses EBV, HPV, HBV, HTLV, HHV8
- Intestinal viral infections * rota-, parvo-, Norwalk...
- Haemorrhagic fever * dengue, ebola, lassa, ...
- Neurotropic viruses * arbo-, rhabdo-...
- HIV- AIDS

Exanthema

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graph TD; Exanthema --> Maculo-papular; Exanthema --> Vesiculo-pustular; Exanthema --> Petechial_purpura; style Maculo-papular fill:#fff,stroke:#ccc; style Vesiculo-pustular fill:#fff,stroke:#ccc; style Petechial_purpura fill:#fff,stroke:#ccc;
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Maculo-papular

- Measles
- Rubella
- Fifth/ Sixth disease

Vesiculo-pustular

- Varicella/ Zoster
- (variola)
- macula
- papule
- vesicula (blister)
- pustula
- crust

Petechial (purpura)

- enteroviruses
- (!! meningococcus, rickettsiae, haemorrhagic fever ...)

MEASLES

vaccine-preventable illness worldwide

Etiology: ***measles virus (paramyxovirus)***

Incidence: ***rare cases in Western countries***

- population is vaccinated from 1963

- developing countries - epidemics

(30 mil cases +1 mil deaths/yr)

Source: ***infected person***

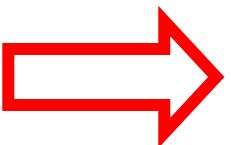
Transmission: ***respiratory droplets, high infectivity***

Incubation period: 8-14 days (usually 10 days)

MEASLES

PRODROMES
conjunctivitis
Koplik's spots

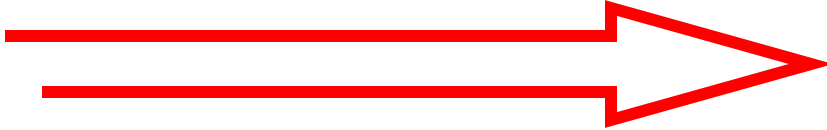
8-10 days



catarrhal
pharyngitis

1. viremia

2. viremia



Follicular hyperplasia LN
+ giant multinucleated cells

Warthin-Finkeldey

EXANTHEMA

Hypersensitivity
reactions against
endothelial cells



lymphocytic
capillaritis

COMPLICATIONS

immunosuppression

Measles
interstitial
pneumonia

postinfectious
leukoencephalitis
SSPE

RUBELLA

Etiology

Rubella virus RNA (Toga)

Source:

Sick person

Transmission:

respiratory droplets

- low infectivity

- mild symptoms

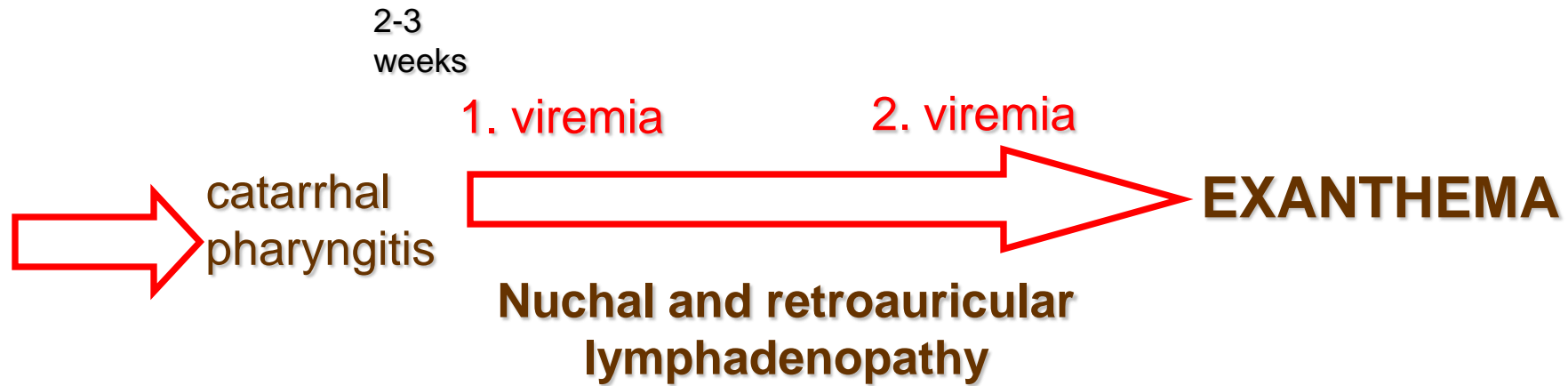
- often asymptomatic

x complication: Rubella fetopathy

- vaccination

- Incubation period: 2-3 weeks

RUBELLA



x complication:

Rubella fetopathy

Rubella FETOPATHY

MICROCEPHALY

PMR

Blindness

Cataracta

Glaucoma

Retinopathy

Malformations of
heart

Deafness

Gregg's syndrome

FIFTH DISEASE

Erythema infectiosum

Parvovirus B19

- school children

SIXTH DISEASE

Exanthema subitum

HHV-6 (and HHV-7)

- infants and toddlers, spring

fever + rash

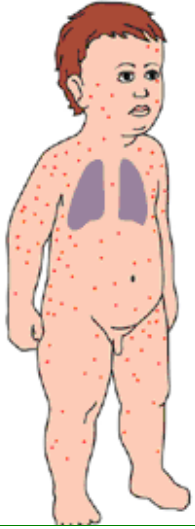
EPID:

x100/ yr

common

self-limited, rare complications

COMPLICATIONS



Varicella-zoster virus



Nonimmune individual
(usually child)



CHICKEN POX

impetigo (Sf. aureus, Str. pyog)

Varicella encephalitis

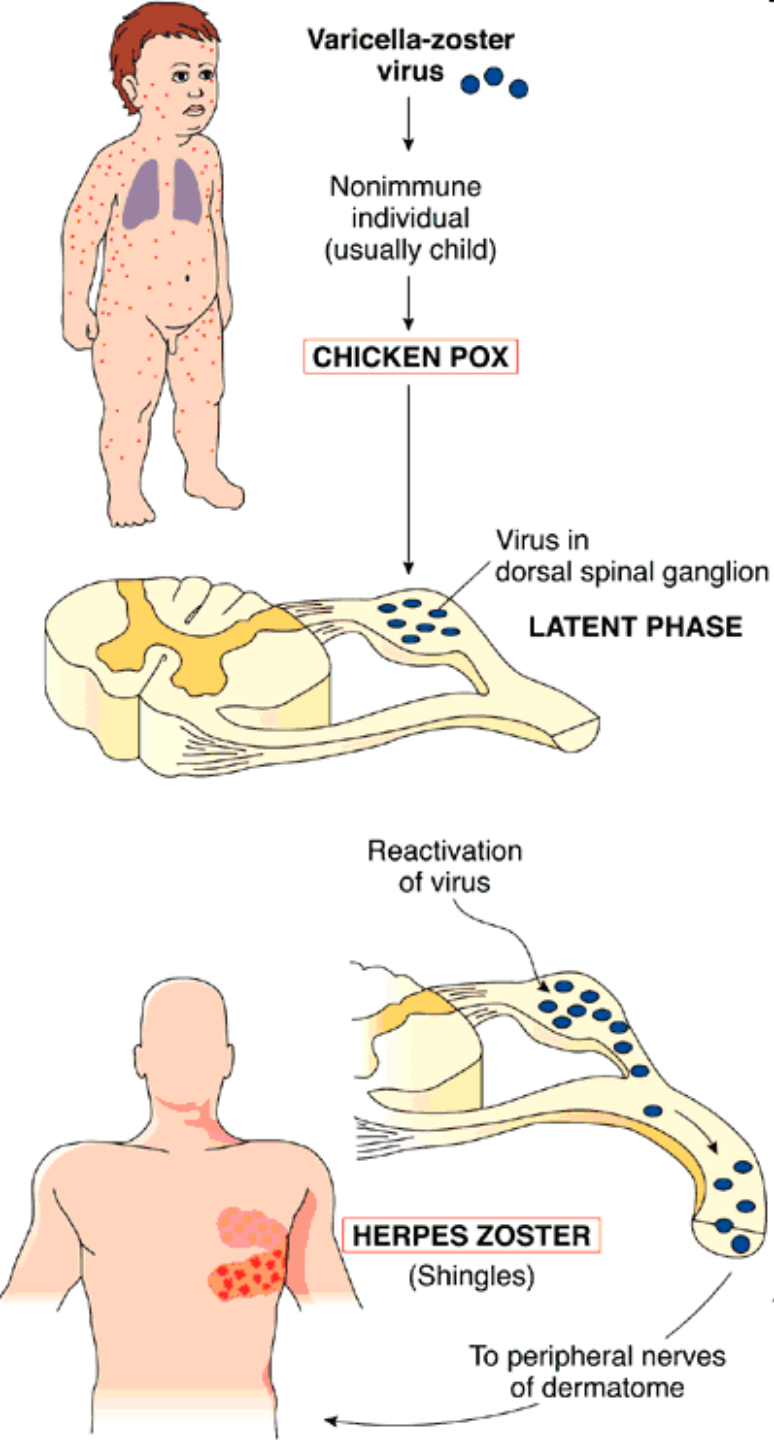
Varicella IS pneumonia

Varicella polyneuritis

Guillain-Barré type

VZV - CHICKEN POX

VZV - Shingles



Rash + burning + PAIN

contact with secretions

Herp. gingivostomatitis

Primary infection

Herp. keratoconjunctivitis



peri/intraaxonal
senzoric ganglia - ggl. Gasseri

Latency



stress
sun exposure
cold
menstruation...

Reactivation



Herpes labialis

Herpetic encephalitis

immunodeficiency



Complications



- Herp. **hepatitis**
- Herp. **oesophagitis**

CMV

asymptomatic

congenital
infection
in utero

vaginal secretions
breastmilk
perinatally

saliva, sexual
intercourse, droplets,
FEK-oral, iatrogenic
(transfusion ...)
postnatally
immunocompetent

**Cytomegalic
inclusion disease
(CID)**

Perinatal CMV

IS pneumonia + hepatitis

„CMV mononucleosis“

**Disseminated
CMV infection**

REACTIVATION
immunosuppressed

- transplantation
- AIDS

- IUGR - abort
- hepatitis - jaundice
- bone marrow - anemia, thrombocytopenia
- necrotizing encephalitis - microcephaly with calcifications
- kidneys, salivary glands ...

Disseminated CMV infection in immunosuppressed patients

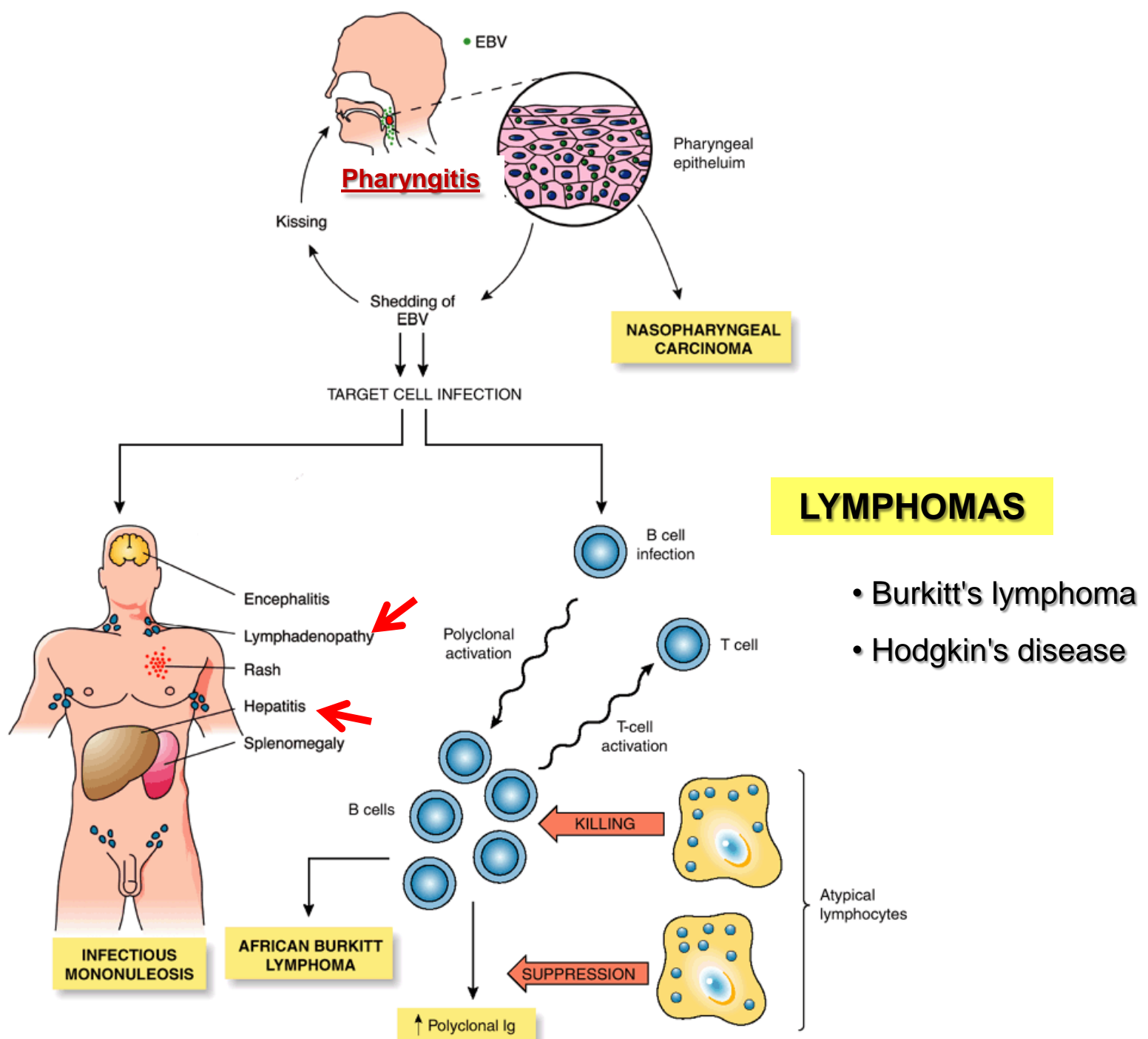
- **Lungs** - IS pneumonia and ARDS
- **Intestine** - necrotizing pseudomembranous enterocolitis - ulceration, diarrhea ...
- **EYE** - CMV retinitis - blindness

brain mostly NOT!

"Transforming" infections

- EBV
- HPV
- HBV
- HTLV
- Kaposi sarcoma herpesvirus (KSHV/HHV8)

EBV



HHV-8

Immunocompetent patient



asymptomatic?

immunosuppression

HIV+
transplantation

saliva

sperm

blood



endothelium

B-cells

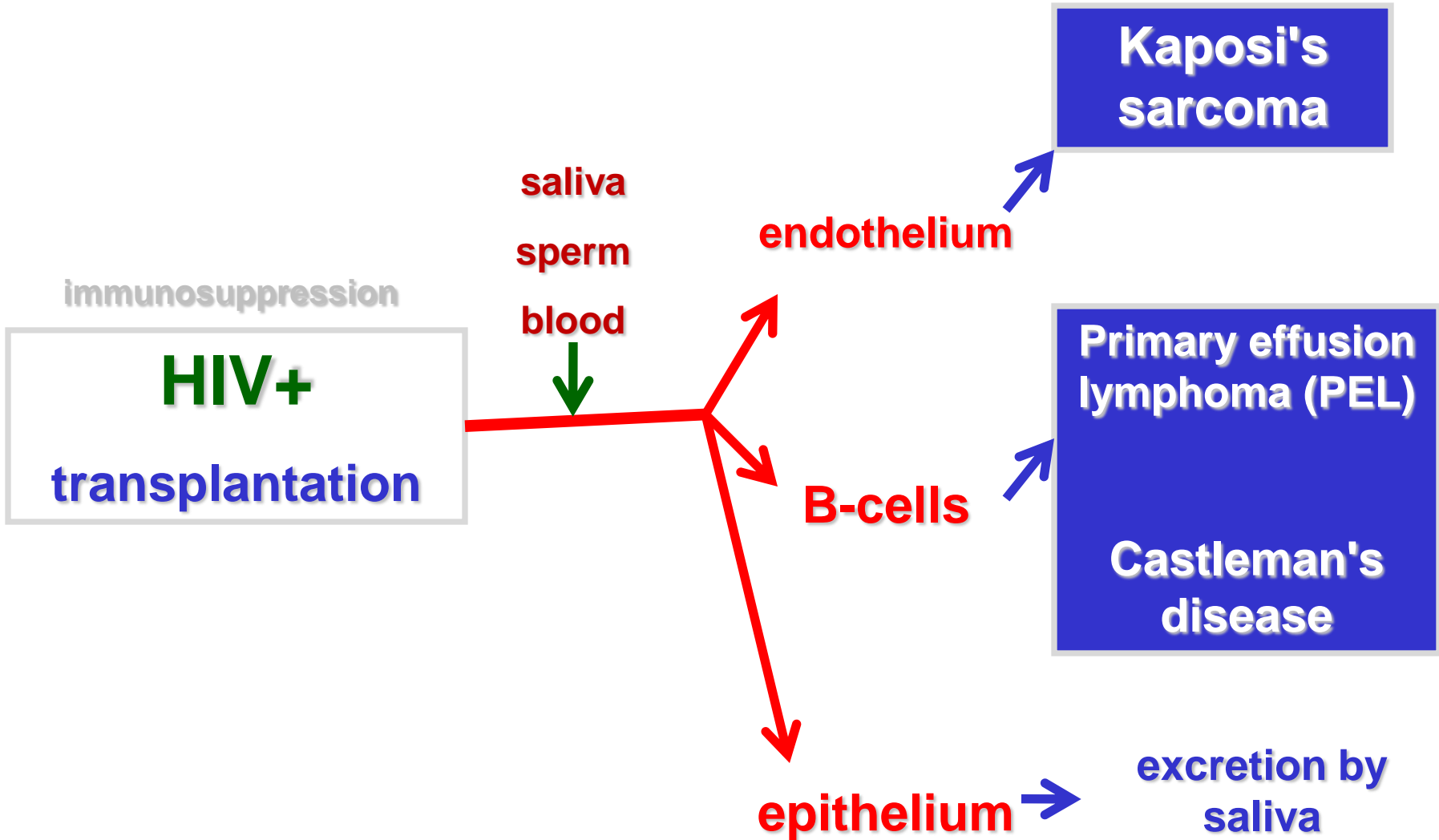
epithelium

Kaposi's sarcoma

Primary effusion lymphoma (PEL)

Castleman's disease

excretion by saliva



HPV

- DNA papovavirus
- transmission by direct contact
- infection of the basal layer of the epithelium

types 1, 2, 4

(wart)

verruca vulgaris, verruca plantaris

types 6, 10, 11, 40-45

condyloma acuminatum

laryngeal papillomatosis

types 16, 18, 31

CIN / VIN / VaIN – squamous cell ca

(5% ca oral cavity, larynx)

- proliferation of squamous epithelium
(acanthosis, papillomatosis, hyperkeratosis)
- cytopathic effect - **koilocytosis**
- +/- dysplastic changes (according to HPV type)

Respiratory viral infection

rhinoviruses

coronaviruses

mechanism:

- catarrh + epithelial necrosis

rhinitis
faryngitis

laryngotracheitis

parainfluenza

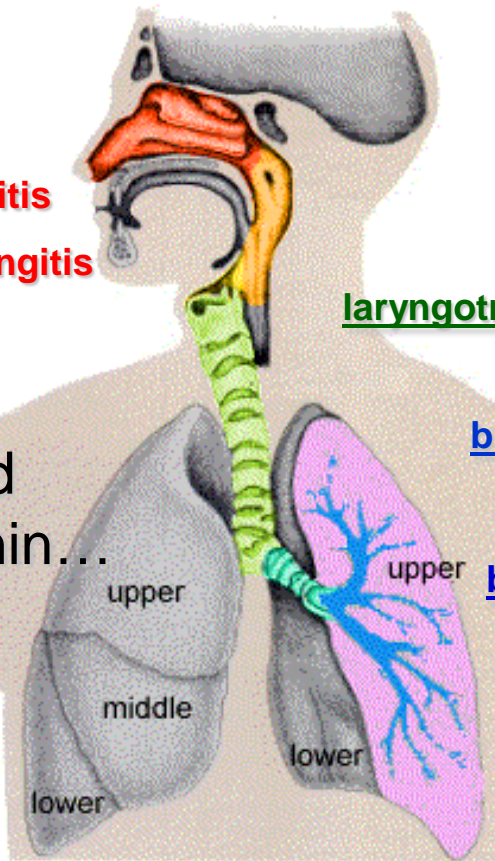
bronchitis

influenza

bronchiolitis

RSV

IS pneumonia



mechanism:

- without necrosis
- chemically - induced production of bradykinin...

complications:

bacterial superinfection

- sinusitis
- otitis media

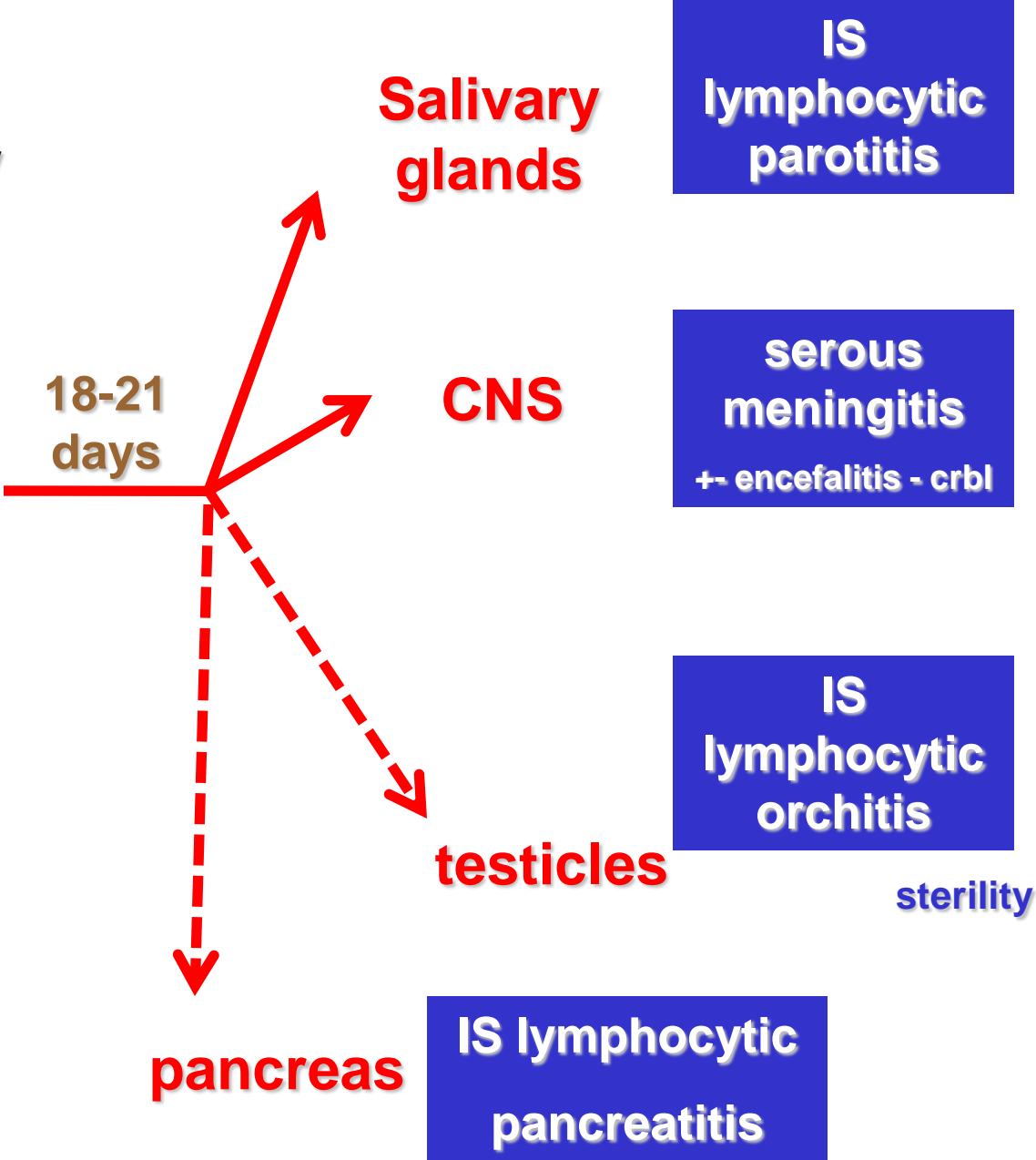
complications:

bacterial superinfection
bronchopneumonia

MUMPS

- Children 5-15 years
x even adults
- postinf. permanent immunity

Source: sick person
Transmission: droplets



HIV / AIDS

Immuno-etiopathogenesis

CD4+
T lymphocytes

- lymphopenia
- CD4+ T lymphocytes dysfunction
- delayed hypersensitivity disorders

polyclonal activation of B cells

- circulating immune complexes
- hypogammaglobulinemia
- inability to process Ab against new antigens

Opportunistic
INFECTIONS

CANCER

Additional infections
(Pneumococci, Haemophilus,
staphylococci ...)

macrophages

dendritic cells

- important reservoir of infection
- "transport medium" - into CNS
- impaired immune function

- restrictions on chemotaxis and phagocytosis
- decreased ability to present antigen to T-cells
- decreased spontaneous secretion of IL-1, TNF, IL-6

AIDS
dementia complex

INFECTIONS

Opportunistic protozoan infections

- **Cryptosporidium** (enteritis - diarrhea)
- **Pneumocystis jiroveci** pneumonia
- **Toxoplasmosis** (necrotizing encephalitis / pneumonitis)

Mycoses

- **Candidiasis** (superficial and systemic)
- **Cryptococcosis** (meningitis, "cryptococcoma")
- **Histoplasmosis**

Bacterial infections

- **Mycobacterioses** (TBC + atypical mycobacteriosis)
- **Nocardiosis** (pneumonia, meningitis)
- **Salmonellosis, Legionellosis**

Viral infections

- **Cytomegalovirus** (IS pneumonia, pseudomembranous enterocolitis, retinitis)
- **Herpes simplex virus** (HSV- oesophagitis, hepatitis; persistent skin lesions)
- **VZV**
- JC virus – **Progressive multifocal leukoencephalopathy** (PML)

HHV-8

- Kaposi's sarcoma

EBV

- B- NHL (hl. extranodal)
 - primary CNS lymphoma
 - primary effusion lymphoma
 - ...

HPV

- ca of uterine cervix
- ca ani

HIV / AIDS

Neurological complications

AIDS DEMENTIA COMPLEX



ENCEPHALITIS

toxoplasmosis, PML, HSV, VZV, (CMV)

+

Lymfoma of brain

+

Direct cytopathic effect of the virus

(x not encephalitis - neuronal degeneration + apoptosis)

macrophages - infection of glial cells - cytokines - degeneration of neurons

HIV / AIDS

Clinical stage



2-3 weeks

ACUTE RETROVIRAL SYNDROME
flu-like / mononucleosis-like syndrome
2-3 weeks

A

ASYMPTOMATIC INFECTION

PERSISTENT GENERALIZED LYMPHADENOPATHY



Latency

Early symptomatic stage

B



Progression

Late symptomatic stage
= AIDS

(constitutional disease, neurological manifestations, tumors, secondary infections)

C - AIDS