

Neuroinflammation

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Bacterial infections of the Nervous System

- acute bacterial meningitis
- an hematogenous infections of leptomeninges
- tissue invasion - paranasal infection, craniocerebral injury/tissue invasion
- clinical pattern: headache, stiff- neck, fever, meningeal syndrome

Bacterial infections

- The most common pathogens in meningitis:
- Gram-positive pathogens:
- Pneumococci
- Streptococci
- Staphylococci
- *Listeria monocytogenes*

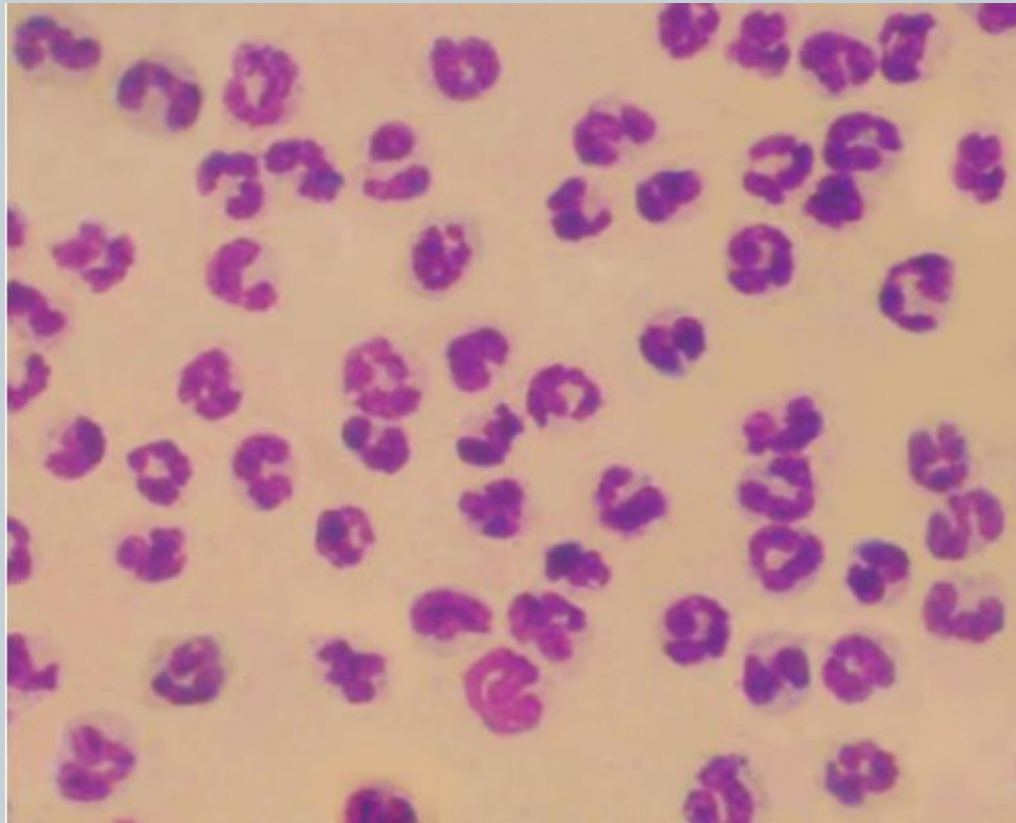
Bacterial infections

- Gram - negative pathogens:
- Meningococci (*Neisseria meningitidis*)
- *Haemophilus influenzae*
- *Escherichia coli*

Bacterial infections

- CSF findings in bacterial meningitis
- cloudy appearance of CSF, granulocytic pleocytosis, high increase of protein content, decreased glucose, increased lactate, microscopic detection of bacteria

Neutrophils in purulent CSF inflammation



Chronic bacterial infections of the Nervous System

- Pathogens
- Treponema pallidum, Mycobacterium tuberculosis, Listeria monocytogenes, Borrelia
- clinical features: headache, involvement of cranial nerves, vascular ischaemic lesion, hydrocephalus
- brain abscess /antibiotics, neurosurgery
- spinal epidural abscess/antibiotics,surgery

Brain abscess - MRI scan



Viral infections of the Nervous System

- isolated meningitis

Coxsackieviruses A and B, HSV, VZV, mumps, HIV

- meningoencephalitis

HSV, VZV, CEE virus, CMV, enteroviruses, HIV

- cranial neuritis

VZV, HSV, CMV, HIV, CEE virus

- myelitis

Coxsackieviruses A and B, echoviruses, VZV, CEE virus, HIV

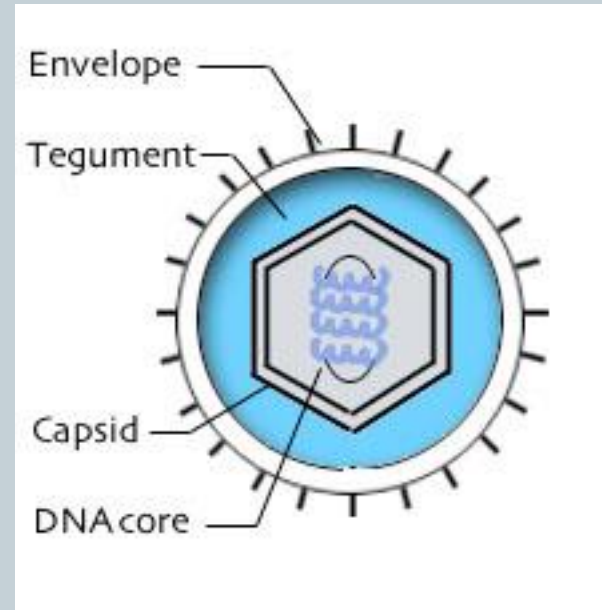
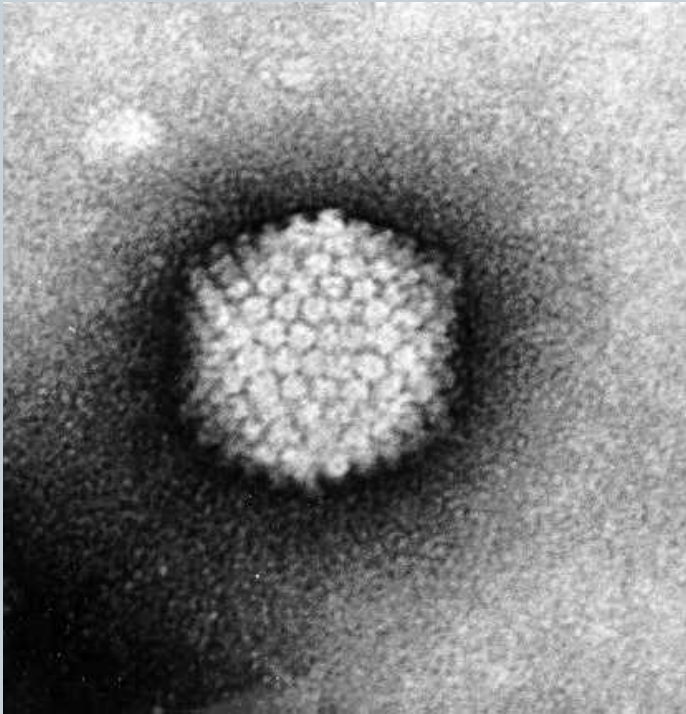
Viral infections of the Nervous system

- CSF findings in viral infections
- microbiological analysis
- DNA - polymerase chain reaction
- specific antibody synthesis - AI
- CSF cells count / lymphocytic or mixed cell pleocytosis
- total protein increased
- normal lactate, normal glucose

Viral infections of the Nervous system

- HSV encephalitis (HSV-DNA)
- VZV herpes zoster (VZV-DNA)
- Tick - borne encephalitis (Central European encephalitis (CEE) - ELISA - antigen specific antibodies IgM and IgG + inflammatory CSF pattern
- West Nile virus - mosquito transmitted flavivirus

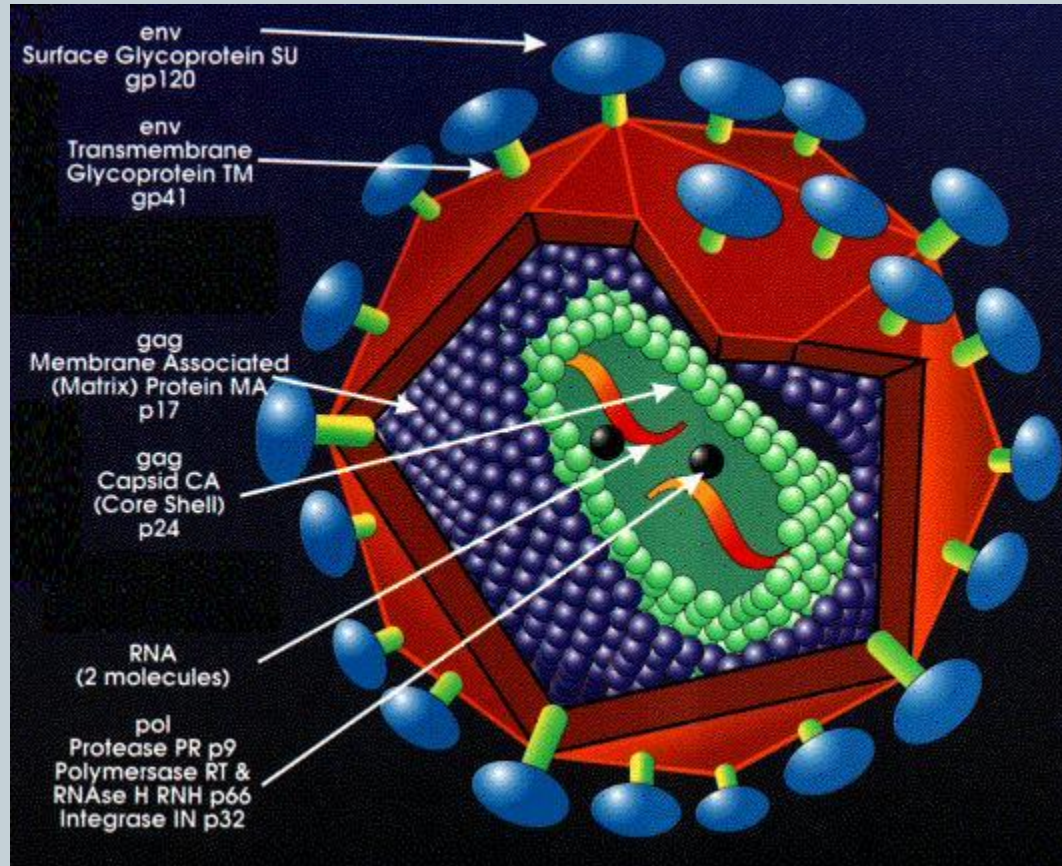
Structure of herpetic virus



Viral infections of the Nervous system

- Cytomegalovirus (CMV) - Herpesviridae
- Human Immunodeficiency Virus (HIV) RNA
- Clinical pattern HIV: meningitis, myopathy, neuropathy, myelopathy and encephalopathy - laboratory test ELISA
- PCR detection HIV and viral load

HIV structure



Infection of the Nervous System by Fungi and Other Opportunistic Pathogens

- *Toxoplasma gondii* - intracellular parasite
- Toxoplasmosis (cerebral toxoplasmosis) - AIDS,
- Congenital toxoplasmosis
- Cryptococcosis - (*Cryptococcus neoformans*)
most common mycosis of CNS - AIDS -
microscopic detection by India ink staining
- Candidiasis - (*Candida albicans*), long - term
immunosuppressive treatment

Infection of the Nervous system by Fungi and Other Opportunistic Pathogens

- Aspergillosis (*Aspergillus fumigatus*) - immunocompromised patients (multiple brain abscesses), granuloma, meningitis
- Neurosyphilis - *Treponema pallidum* - Spirochaetacea - 3 stages:
- 2 st.: asymptomatic meningitis, paralysis of cranial nerves
- 3 st.: parenchymatous neurosyphilis

Infection of the Nervous system by Fungi and Other Opportunistic Pathogens

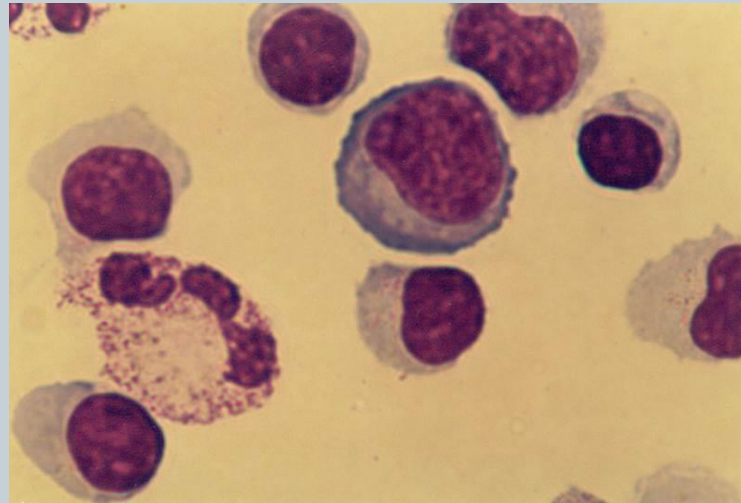
- Neuroborreliosis - *Borrelia burgdorferi sensu stricto*, *B.garinii*, *B.afzelii* - multisystemic disease
- 2.st. meningopolyradiculoneuritis - Bannwarth syndrome, lymphocytic meningitis, dg.ELISA , specific antibody positive index (AI - Bb)

Infection of the Nervous system by Fungi and Other Opportunistic Pathogens

- Progressive Multifocal Leukoencephalopathy(PML)
- JC virus (polyomavirus)
- Immunocompromised and AIDS patients
- Natalizumab (Tysabri) treated patients
- JCV - AI ≥ 1.4 , 20 % mortality, risk stratification
- Subacute Sclerosing Panencephalitis (SSPE)
- measles infection - persistent infection with incomplete measles virus
- Progressive rubella panencephalitis

Case report 1

- Man, 39- years old, chronic dialysis programme, renal transplantation 1/2017, arterial hypertension, hypothyreosis
- 5/2017: 2 weeks fever, consciousness disturbance, epileptic seizure, cerebrospinal fluid - mixed cell inflammation



- PCR herpetic viruses, enteroviruses negative

Case report 1

- Antibodies against CEE (Central European encephalitis virus):
 - 1. withdrawal (25.5.2017):
 - serum: IgG negative, **IgM positive** (IP 1,6)
 - CSF: IgG negative, **IgM positive** (IP 2,3)
 - 2. withdrawal (13.6.2017):
 - serum: IgG negative, IgM negative (IP 0,7)
- coma, GCS 3, lesion in the brainstem, exitus letalis 16.6.2017
- **Dg: brainstem lesion (inflammation)caused CEE virus in immunosupressed patient**

Case report 2

- woman 67 years old
- 7/2017: patient was admitted to hospital with sudden visual lesion of both eyes, blindness on the left eye ,anisocoria, distorted shape of left iris, convergetion reaction lost billateraly



- cognitive impairment, dementia, walking disturbance hypacusis , history of herpes zoster thoracis 5/2017
- CSF: lymphocytic inflammation (13,9 mono/ul), oligoclonal bands IgG 0/22, PCR herpetic viruses negative, anti- borrelia antibodies negative, CEE antibodies negative

Case report 2

- screening tests for syphilis:
 - serum RPR **1:32**, anti-TP **342,0 positive**
- Confirmation tests for syphilis:
 - serum: ELISA IgG positive, IgM borderline
 - WB IgG positive, IgM equivocal
 - CSF: ELISA IgG positive, IgM negative
 - WB IgG positive, IgM negative
 - intrathecal synthesis positive** (AI=2,0)
- MRI scan: moderate T2 hyperintense lesions of white matter periventricular and T2 hyperintense lesions juxtacortically, diffuse brain atrophy

Case report 2

- tabes dorsalis – degenerative lesions in dorsal part of spinal cord in the late stage of neurosyphilis, sensory disturbances, spinal ataxia, walking disturbance
- tabes dorsalis – pathognomonic Argyll Robertson's pupil
- complications of tabes dorsalis – deafness, blindness, brain atrophy, dementia

- **Diagnosis – neurosyphilis**