

# Infectious brain disease

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**Infectious brain diseases** are caused by various agents. They attack us and, at the expense of our own tissues, they begin to multiply and spread throughout the body. The entrance site is often the **mouth, skin, and mucous membranes**. Less often, the pathogen enters the skull directly (trauma).

The most common causes of infection are **bacteria or viruses**. **Parasites and fungi** can also cause infectious brain diseases, but outbreaks usually occur when the human immune system is weakened.

The infection is most often **transmitted** through contact with infected people and animals. Pathogens are transmitted in a variety of ways (via respiratory droplets, blood,...).

## Meningitis

### Bacterial meningitis

One of the most serious infectious diseases is meningitis. An inflammatory infiltrate appears here, consisting mainly of neutrophils (→ pus). Meningitis is a very serious disease that develops quickly and directly threatens the patient's life. It is therefore necessary to start therapy (antibiotics, empirical therapy) as soon as possible. With a complicated course, the most common sequelae of the disease are blindness, deafness, and epilepsy.

#### The inventors

- *Streptococcus pneumoniae* (pneumococcus)
- *Haemophilus influenzae*
- *Listeria monocytogenes*
- *Neisseria meningitidis* (meningococcus)
- *Staphylococcus aureus*
- *E. coli*

The different types of bacteria differ in the **age group** in which they cause meningitis. However, this is not entirely true, especially in immunosuppressed patients. *E. coli* mainly affects newborns, *S. pneumoniae* mainly affects young children and the elderly, and *N. meningitidis* mainly affects adolescents.

In **Neisserial meningitis**, meningococcal sepsis may develop, which is characterized by the appearance of small purple patches on the skin, which are a manifestation of clogging of small capillaries.

### Viral meningitis

Viral meningitis occur less frequently. Lymphocytes dominate the inflammatory infiltrate (→ without pus).

## Encephalitis

### Viral encephalitis

Viral diseases most often affect the **parenchyma of the brain**, leading to **encephalitis**. Encephalitis can progress to the meninges (meningoencephalitis). For example, tick-borne encephalitis (a virus in the *Flaviridae* family) affects both the brain and the meninges. Initially, 5-9 days after infection, the disease manifests as fever and headache. Gradually, the intensity of pain increases, disorientation appears, and disorders with limb mobility manifest. A typical symptom is stiff muscles in the neck.

Other common agents include herpes viruses, especially in people with very low immunity and in newborns. Their course can be of various difficulties. However, they are often a cause of death. In less severe cases, there is damage to sight, hearing, or mental retardation.

**TIP: Check *Encephalitis caused by herpes simplex viruses for more information.***

### HIV and AIDS

Another serious viral infectious disease is HIV infection, which in later stages, after the development of AIDS, manifests as dementia.

### Rabies

We no longer commonly encounter this disease (in our regions) thanks to effective **vaccination** of wildlife.

The disease progresses **in a retrograde fashion** from the peripheral nerves to the CNS. If the infection reaches the brain, the patient can no longer be saved and the patient dies within a few days. The so-called Negri bodies are a typical finding in the brain. These are intracellular inclusions in the cytoplasm of some nerve cells in which the rabies virus replicates.

The *causative agent* is *Lyssavirus*.

## Infections caused by fungi

### Candida infection

Infections with opportunistic pathogens of the genus *Candida* (*C. albicans*, *C. cruzeli*,...) occur almost exclusively in immunosuppressed patients and patients suffering from AIDS.

## Cryptococcosis

Infectious diseases of the brain can also be caused by other yeasts, as is the case with cryptococcosis. It mainly affects people with impaired immunity, namely patients with AIDS or after a transplant. The yeast occurs in bird droppings is then inhaled, multiplies in the lungs, and then spreads to the brain. The symptoms and course of the disease are similar to meningoencephalitis.

The causative **agent** is a fungus of the genus *Cryptococcus* (most often *Cryptococcus neoformans*).

## Aspergilloma

When infected with a fungus of the genus *Aspergillus*, a typical formation develops in the brain that mimics a brain abscess. It occurs in immunosuppressed patients and patients suffering from AIDS.

The causative **agents** are fungi of the genus *Aspergillus*.

## Parasitic infections

Parasites can also cause brain infections.

### Neurocysticercosis

**Neurocysticercosis** is a less common parasitic disease of the brain. It manifests as infectious acquired epilepsy.

The causative **agent** is the tapeworm *Taenia solium*, or its eaten eggs.

### Toxoplasmosis

Toxoplasmosis causes encephalitis, abscesses, and calcifications. The most vulnerable groups are the fetuses of mothers in the first and second trimesters and immunocompromised individuals. The intermediate host is a cat.

The causative **agent** is *Toxoplasma gondii*

### Amoebic meningoencephalitis

The disease has a widespread distribution, but is especially abundant in America. The parasite enters the brain along the olfactory nerve through the nasal mucosa. Nerve cell destruction occurs accompanied with an inflammatory reaction. The victim falls into a coma, and death follows very quickly.

Individuals can become infected in thermal baths and heated pools, where the pathogen often occurs.

The causative **agent** is the amoeba *Naegleria fowleri*.

**TIP: Check the articles Cysticercosis or Toxoplasmosis!**

## References

### Related articles

- Viral infections of the nervous system
- Meningeal syndrome
- Brain abscess
- Amphizotic amoebae
- Meningitis • Meningitis (Pediatrics)
- Viral meningitis • Serous meningitis and meningoencephalitis • Herpetic meningoencephalitis
- Purulent meningitis • Purulent meningitis (Pediatrics) • Hemophilic meningitis • Tuberculous meningitis
- Neuroinfection, CNS/PGS inflammation • Encephalitis

### External links

- Meningitis (<https://nemoci.vitalion.cz/zanet-mozkovych-blan/>)
- Toxoplasmosis (<https://www.wikipedia.org/wiki/cs:Toxoplazm%C3%B3za>)
- Cysticercosis (<https://www.wikipedia.org/wiki/cs:Cysticerk%C3%B3za>)

### References

- BEDNÁŘ, Marek, Andrej SOUČEK and Věra FRAŇKOVÁ, et al. *Medical microbiology: Bacteriology, virology, parasitology*. 1st edition. Prague: Marvil, 1996. 558 pp. ISBN 80-238-0297-6 .
- LOBOVSKÁ, Alena. *Infectious diseases*. 1st edition. Prague: Karolinum, 2001. 263 pp. ISBN 80-246-0116-8 .
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