

# Neisseria meningitidis

*Neisseria meningitidis* ("meningococcus"), a genus of *Neisseria* bacteria that belongs to Gram-negative cocci, is a cosmopolitan bacterium that causes invasive meningococcal disease (IMD). It is transmitted by air droplets. The disease usually starts suddenly within a few hours, a serious clinical picture emerges from full health. The IMD is still life-threatening, with a mortality rate of around 10%. Children under the age of five, adolescents and young adults aged 15-25 are most often affected.

## Morphology and characteristics

*Neisseria meningitidis* is a **Gram-negative diplococcus**. They are **non-sporulating**, mostly encapsulated. They are easily subjected to autolysis, thus losing their characteristic shape and changing their color properties. Cultivation-demanding-complex cultivation substrates with protein in native state, CO<sub>2</sub>, moisture. Cultivation is **strictly aerobic**. The bacteria produces catalase and oxidase. Acidifies carbohydrates without gas formation. According to their properties, it can be distinguished from other *Neisseria*. The most important antigen - **capsule polysaccharide** - is protective; and can be changed by transformation; during the presence of the bacteria in the blood and cerebrospinal fluid. A total of 13 serogroups are distinguished, with serotypes A, B, C, Y and W135 being the most common worldwide. It has cosmopolitan occurrence. Invasive meningococcal disease (IMD) epidemics caused by serogroup A meningococci typically occur in the southern Sahara region. Group B (sporadically) and C (in local epidemics) are more common causes of IMD worldwide, as well as in Europe. IMD cases by groups Y and W135 are growing, especially in countries such as Saudi Arabia, Burkina Faso, and some African countries.

## Pathogenicity and pathogenesis

It is a natural primary pathogen for humans only. It is transmitted by droplets. Large epidemics are more common in North Africa. In the Czech republic, children and adolescents are at highest risk. one of its virulence factor is its serogroup-specific **polysaccharide capsule**. With the exception of serogroups A, all other capsular polysaccharides are enriched with **sialic acid**, which equips the bacteria with resistance to alternative pathway of complement activation by reducing the possibility of meningococcal phagocytosis. Antibodies against capsule antigen (as opsonins, in the presence of complement bactericidal).

## Etiopathogenesis and symptoms

It is transmitted by air droplets. The incubation period is between 1-8 days. *N. meningitidis* colonizes the nasopharynx and enters the bloodstream (meningococcemia). It manifests as a febrile illness characterized by exhaustion, severe muscle and joint pain, headache, and somnolence (symptoms of intoxication with released endotoxin). Petechiae or suffusions can be present on the skin and they are constantly increasing. A clinical picture of sepsis is formed.

Invasive meningococcal disease may take the form of purulent meningitis, which may be accompanied by vomiting, or impaired consciousness or convulsions. Skin symptoms may not always occur.

Meningococcal sepsis is the most severe form of IMD. Sepsis very soon progresses to septic shock with respiratory and renal failure. Fortunately, this severe sepsis, which almost always ends with death, is rare.

## Laboratory diagnostics

Detection of *Neisseria meningitidis* is in blood culture or from cerebrospinal fluid (microscopically or by cultivation). Rapid antigen detection is made by bedside cerebrospinal fluid agglutination test. We observe Gram-negative diplococci in a microscopic smear. Other methods include PCR (from blood and cerebrospinal fluid).



Gram-negative *Neisseria meningitidis* in Gram stain of CSF

## Treatments

Intravenously crystalline penicillin, also 3rd generation cephalosporins (cefotaxime, ceftriaxone). Glucocorticoids are used against endotoxins.

## Prevention

Active immunization by conjugate vaccines (against groups A, C, Y, W) - is a polysaccharide vaccines made for children from two years of age. A vaccine against meningococci type B has been available in the Czech Republic since 4/2014.

## Video



## Links

### Related articles

- Meningococcal meningitis
- Invasive meningococcal diseases
- Microbiology repetitorium

### Reference

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2. ROHÁČOVÁ, H. INVASIVE MENINGOCOCCAL DISEASES. *INTERNAL MEDICINE FOR PRACTICE* [online] . 2004, vol. -, vol. 1, pp. 40-43, also available from < <http://www.solen.cz/pdfs/int/2004/01/10.pdf> >.
3. BEDNÁŘ, M, A SOUČEK and V FRAŇKOVÁ, et al. *MEDICAL MICROBIOLOGY: Bacteriology, virology, parasitology*. - edition. Triton, -. 560 pp. ISBN 859-4-315-0528-0 .