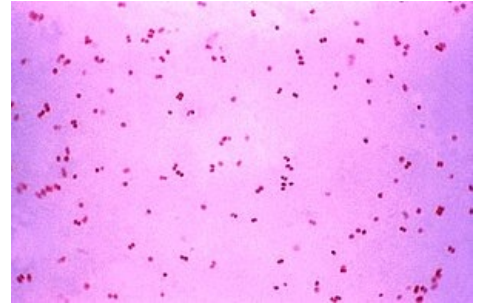


# Neisseria gonorrhoeae

The bacterium *Neisseria gonorrhoeae* (gonococcus), was discovered in 1879 by the German physician Albert Neisser, after whom it is also named. It causes the sexually transmitted disease **gonorrhoeae**, known as **gonorrhoea** in Czech.

Taxonomy:

- tribe *Proteobacteria*;
- class *Beta Proteobacteria*;
- Order *Neisseriales*;
- family *Neisseriaceae*;
- genus *Neisseria* (together, for example, with *Neisseria meningitidis*).



NeisseriaGonorrhoeae

## Properties

*Neisseria gonorrhoeae* is:

- **aerobic**;
- **non-sporulating**;
- **pathogenic**;
- **gram negative**;
- elongated coccus - **diplococci**;
- **fimbriae** occur on the surface for adhesion.

*Neisseria gonorrhoeae* does not occur freely in nature. The only *source of infection is humans*. Gonococci are very **sensitive** to the external environment (temperature changes, humidity, common disinfectants, etc.) and therefore transmission occurs exclusively by **intimate contact**. Due to the fimbriae, the bacteria bind firmly to the epithelium and can't be removed by urine. Infection can spread to the **uterus**, and bacteria can also infect the *rectal mucosa* or the *pharynx*. During menstruation, it is easier for the infection to progress to the **Fallopian tubes**. Because the bacteria are **very sensitive** to the environment, they do not multiply in the urine and thus the infection does not spread to the bladder or kidneys. Gonococci are also affected by hormones, estrogens promote their growth, testosterone and progesterone inhibit it.

## Diagnostics

**The removed material must be processed immediately! If this is not possible, a transport medium (higher CO<sub>2</sub> tension, proteins, sufficient moisture) must be used to maintain the viability of the gonococci (very sensitive bacteria).** ⚠ **Material:** purulent discharge.

### Microscopy

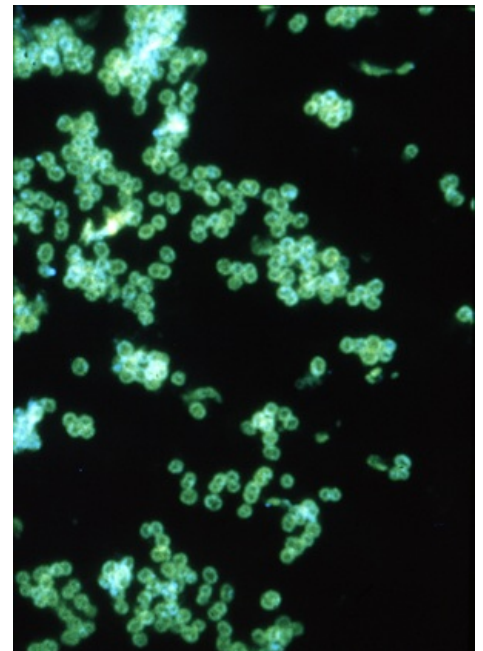
G- diplococci. Often found in neutrophils that phagocytosed them.

### Cultivation

For culturing, **selective media** are used, these are **enriched agars** that contain added starch, antibiotic and bovine serum). **Chocolate agar** and antibiotic-enriched agar (Thayer-Martin) are mainly used.

### Culture-procedure

Inoculate on pre-warmed agar (sensitivity to low temperature). Optimal growth is ensured by adding heated blood called **chocolate agar** or ascitic fluid to nutrient agar and culturing at 35-37 °C in a humid atmosphere containing 5-10% CO<sub>2</sub>. In practice, chocolate agar is usually enriched with antibiotics and antimycotics - thus creating **Thayer-Martin** agar containing vancomycin, colistin and nystatin, or New York City medium. Growth is slow, but on good medium they grow in 8-24h in grey, shiny, slightly convex colonies. Gonococci can be divided into 4 types (T1-T4) based on colony appearance, antiagglutinability, virulence, and ability to cause urethritis in humans. The most virulent strains were found to be T1 and T2 having numerous fimbriae, while strains T3 and T4 are avirulent.



Immunofluorescence image of *Neisseria gonorrhoeae*

### Tests

Positive catalase test, positive oxidase test, cleaves glucose, does not ferment maltose (unlike meningococcus).

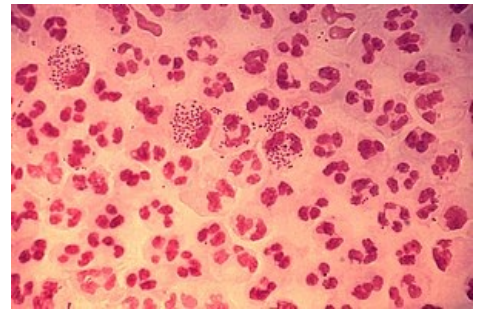
## Serological methods

ELISA (direct detection of antigens), indirect diagnosis in chronic forms of the disease.

## Virulence factors

Virulence factors are defined as bacterial agents that damage the host or cause disease. *Neisseria gonorrhoeae* possesses the following agents:

- **pili** - allows very tight binding of fimbriae (pili) to mucosal epithelium and resistance to phagocytosis;
- **porin** - a surface protein of the outer membrane permeable to hydrophilic substances, its structure is related to antibiotic sensitivity;
- **LOS (lipooligosaccharide)** - saccharide part is involved in adhesion, lipid part acts as endotoxin; LOS also prevents complement-mediated lysis of *neisseria*;
- *Opa protein* - responsible for endocytosis leading to host cell destruction;
- *IgA1-protease*, *β-lactamase*;
- **Transferrin, lactoferrin and hemoglobin** - binding proteins;
- **Gene conversion capability** - gonococci are able to rearrange the antigenic components of fimbriae to create a new serotype and thus the host must produce a new type of antibody.



Gram staining - Gonococcal urethritis

## Diseases

*Neisseria gonorrhoeae* causes an acute, inflammatory disease of the urogenital tract called **gonorrhoea**. The manifestation is a discharge of whitish fluid from the urethra.

 For more information see *Driphoid*.

Mothers suffering from gonorrhea can '**pass gonococci to their newborn babies**' at birth, and develop severe **conjunctivitis**, called blennorrhoea neonatorum. Women are more covert than men and are therefore often carriers.

## Therapy

The treatment of gonorrhoea used to be penicillin ATB (ampicillin), to which at the same time most gonococci show resistance. The drugs of choice are therefore currently the 3rd generation cephalosporins - cefuroxime, ceftriaxone. Because gonococcus very often occurs as a co-infection with chlamydia, beta-lactam ATBs are used in combination with macrolides or tetracyclines. When infected, the infected person should be re-treated along with all his sexual contacts.

## Prevention

There is no vaccine yet. The most important thing is protection during sexual intercourse (condoms). If there is a risk of developing blennorrhoea in newborns, wash the conjunctival sac with Ophtalmo-Septonex or a dilute solution of AgNO<sub>3</sub>.

## Links

### Related articles

- Gonorrhea

### Source

- HORÁČEK, Jiří, et al. *Základy lékařské mikrobiologie*. 1. vydání. Karolinum, 2000. ISBN 80-246-0006-4.
- BEDNÁŘ, M, V FRAŇKOVÁ a J SCHINDLER, et al. *Lékařská mikrobiologie – bakteriologie, virologie, parazitologie*. 1. vydání. Praha : Marvil, 1996. 558 s. ISBN 80-238-0297-6.
- RYŠKOVÁ, Olga, et al. *Mikrobiologie pro studující zubního lékařství*. 1. vydání. V Praze : Karolinum, 2004. ISBN 80-246-0834-0.
- 
- 
- 

## References

1. BEDNÁŘ, M, V FRAŇKOVÁ a J SCHINDLER, et al. *Lékařská mikrobiologie – bakteriologie, virologie, parazitologie*. 1. vydání. Praha : Marvil, 1996. 558 s. ISBN 80-238-0297-6.