

THE ROLE OF GONORRHEA AND SYPHILIS AMONG SEXUALLY TRANSMITTED INFECTIONS

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Abstract: This article, based on the data of the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), and other scientific sources, examines the etiological agents of gonorrhea and syphilis, two of the most significant bacterial sexually transmitted infections (STIs). Their microscopic structure, growth conditions, diagnostic approaches (Gram staining, nucleic acid amplification tests [NAAT], and serological tests such as VDRL and RPR), as well as current treatment and prevention strategies, are reviewed. While *Neisseria gonorrhoeae* can be cultured and identified through direct microbiological techniques, *Treponema pallidum* remains challenging due to its inability to grow in artificial media, necessitating reliance on serological assays. The analysis highlights the importance of early diagnosis and standardized therapy to reduce complications and transmission rates.

Keywords: gonococcal infection, syphilitic infection, bacterial etiology, laboratory diagnosis, Gram staining, NAAT, serological tests, antibiotic therapy, preventive measures.

Introduction.

Sexually transmitted infections (STIs) remain one of the leading public health challenges worldwide. According to the WHO, more than 374 million new cases of four curable STIs (gonorrhea, syphilis, chlamydia, and trichomoniasis) occur annually. Among them, gonorrhea and syphilis stand out due to their global prevalence, potential complications, and social consequences.

Neisseria gonorrhoeae, the causative agent of gonorrhea, is a Gram-negative diplococcus often resembling a "coffee bean" under the microscope. The bacterium primarily infects the urogenital tract but may also affect the rectum, pharynx, and conjunctiva. In contrast, syphilis is caused by *Treponema pallidum*, a spiral-shaped spirochete with unique structural and immunological properties. Unlike gonococcus, *T. pallidum* cannot be cultivated in artificial laboratory media, which complicates direct microbiological diagnosis.

This paper compares the biological characteristics, laboratory diagnostic methods, and therapeutic strategies for gonorrhea and syphilis, emphasizing the clinical and public health importance of early detection and prevention.

Microbiological Features.

Neisseria gonorrhoeae is a Gram-negative diplococcus, typically found intracellularly within polymorphonuclear leukocytes. It is highly sensitive to environmental conditions such as temperature fluctuations, desiccation, and ultraviolet light. For laboratory growth, specimens should be directly inoculated onto selective culture media and incubated at 35–37°C in an atmosphere containing 3–10% CO₂. Colonies generally appear within 24–48 hours. Growth requirements vary among strains, with supplements such as hemoglobin and NAD often necessary.

Treponema pallidum. The causative agent of syphilis, *T. pallidum*, is a delicate spirochete measuring 6–15 µm in length and 0.1–0.2 µm in width. Its spiral morphology and periplasmic flagella allow corkscrew-like motility. Due to its thin structure, the bacterium is not visible under standard light microscopy without special staining (e.g., Giemsa stain) or dark-field microscopy. Importantly, *T. pallidum* cannot be cultured in vitro and requires live host tissue (e.g., rabbit testes) for maintenance. This characteristic makes serological testing the cornerstone of syphilis diagnosis.

Clinical Manifestations

Gonorrhea. In men, gonorrhea typically presents with acute urethritis, purulent discharge, and dysuria, appearing 2–5 days after infection. More than 95% of infected men develop symptoms. Complications include prostatitis, epididymitis, and periurethral abscesses.

In women, gonorrhea primarily affects the cervix, but symptoms are often mild or absent. When present, they include vaginal discharge, dysuria, and abdominal pain. Up to 20% of women may develop pelvic inflammatory disease (PID), which can lead to infertility or ectopic pregnancy. In rare cases, disseminated gonococcal infection results in bacteremia, arthritis, or dermatitis.

Syphilis progresses through multiple stages. The primary stage is characterized by a painless chancre at the site of infection. The secondary stage involves systemic spread, presenting with rash, mucous patches, and generalized lymphadenopathy. If untreated, the disease enters a latent phase and may progress to tertiary syphilis, involving gummatous lesions, cardiovascular damage, and neurosyphilis. Vertical transmission from mother to child can result in congenital syphilis, a condition associated with severe morbidity and mortality.

Sampling Procedures.

Accurate diagnosis depends on proper specimen collection:

Urethral swabs: Purulent exudates, collected with calcium alginate or Dacron swabs.

Urine samples: First 10–15 mL of urine, collected after at least 2 hours without urination.

Cervical and vaginal swabs: Obtained using a speculum; in children, vaginal wash specimens are preferred.

Rectal and pharyngeal swabs: Collected for extragenital gonococcal infections.

Conjunctival swabs: Collected in cases of ocular infection.

Sterile body fluids: Such as synovial, pleural, or pericardial fluids, obtained via aseptic aspiration techniques.

Diagnostic Approaches

Gram Staining: Rapid, inexpensive, and highly specific in symptomatic men. Presence of Gram-negative diplococci within neutrophils is diagnostic of gonorrhea.

Culture: Remains the gold standard for antimicrobial susceptibility testing in gonorrhea.

Nucleic Acid Amplification Tests (NAATs): Highly sensitive and specific for detecting *N. gonorrhoeae* and *T. pallidum* DNA or RNA, recommended for asymptomatic cases.

Nontreponemal: VDRL, RPR (used for screening and monitoring treatment response).

Treponemal: FTA-ABS, TPHA (used for confirmation).

Treatment and Prevention

Gonorrhea: First-line therapy: Ceftriaxone (intramuscular, single dose). Often combined with Azithromycin to cover potential co-infection with *Chlamydia trachomatis*.

Syphilis: Benzathine Penicillin G remains the treatment of choice.

In penicillin-allergic patients: doxycycline or azithromycin may be used.

Prevention relies on safe sexual practices, consistent condom use, regular screening, and prompt treatment of sexual partners. Public health education campaigns remain critical in reducing the incidence of both infections.

Conclusion

Gonorrhea and syphilis continue to pose significant public health challenges due to their prevalence, complications, and diagnostic complexities. The ease of culture and rapid testing make gonorrhea more straightforward to detect compared to syphilis, which relies mainly on serological assays. Despite these differences, both infections can be effectively treated with antibiotics when diagnosed early. Strengthening laboratory capacity, promoting sexual health education, and ensuring access to diagnostic and therapeutic services are essential strategies in reducing the global burden of these STIs.

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