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# Genital Tract Infection as a Cause of Male Infertility

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Additional information is available at the end of the chapter

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## Abstract

Although infection is one of the preventable causes of human infertility, it is always missed or neglected. History of urethral discharge has been reported in about 45% of the black men attending the outpatient clinic with infertility complaint.

Implicated in this aspect is sexually transmitted disease (STD), including chlamydia, gonorrhea, and human immunodeficiency virus (HIV). Nonsymptomatic chronic prostatitis and seminal vesiculitis have been associated with poor semen quality and infertility. Infection may affect male fertility in different ways, including impairment of spermatogenesis, induction of autoimmune mechanisms, obstruction of the ejaculatory ducts, and dysfunction of the ejaculated sperms, decrease in the motility of the spermatozoa, and induction of reactive oxygen species (ROS).

In this chapter, the following points are discussed: 1. Types of genital tract infections that may cause infertility. 2. Prevalence of infection in infertile males. 3. Mechanism by which genital tract infection can cause infertility. 4. Fertility preservation by early diagnosis and treatment of STD. 5. Future perspectives.

**Keywords:** Infections, Urinary tract infections, Infertility in males, Sexually transmitted diseases, Chlamydia, Gonorrhea

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## 1. Introduction

Infertility can be defined as a failure to conceive in a couple trying to reproduce for a period of 2 years of constant unprotected sex [1]. Of all sexually active couples, 12–15% is infertile [2]. Male component represents around 50% of the time either in isolation or in combination with a female factor [1, 3]. Infertility can be attributed to many causes. Infectious agents can interfere with the reproductive function in both sexes. Infections of male genital urinary tract account for about 15% of the case of male infertility. Different sites can be affected in the male reproductive system, such as the testis, epididymis, and male accessory sex glands. Spermatogenesis

itself can be affected by urogenital infections at different levels of development, maturation, and transport of spermatozoa. These infections can be both sexually transmitted and nonsexually transmitted. Among the most common microorganisms involved in sexually transmitted infections, thus interfering with male fertility, are the *Chlamydia trachomatis* and *Neisseria gonorrhea*. Less frequently, male infertility may be due to nonsexually transmitted epididymo-orchitis, mostly caused by *Escherichia coli*. Infections of the lower genital tract seem to have little importance. However, such infections, as well as those involving other parts of the male genital urinary tract, may cause a microbial colonization of the semen [4].

## 2. Types of genital tract infections that may cause infertility

Epididymitis usually caused by gonorrhea, tuberculosis, chlamydia, urea plasmas, *Pseudomonas*, and coliform. Orchitis usually caused by mumps and tuberculosis. Tuberculosis and trichomoniasis are implicated in seminal vesiculitis. Urethritis usually caused by gonorrhea, chlamydiae, ureaplasmas, and trichomoniasis [5–10].

Many infectious organisms can affect fertility. These organisms include bacteria, viruses, yeasts, parasites, tropical infections, and other rare conditions.

### 2.1. Bacterial infections

Urethritis caused by *Neisseria gonorrhea* can affect fertility only if the testes were affected in rare situations. After the human immunodeficiency virus (HIV) epidemic in Western countries, more sexual precautions and hygiene were adopted, and this led to marked decrease in the incidence of *N. gonorrhea* infection in the male genital tract [5].

*Chlamydia trachomatis* can affect both sexes but has a much greater impact on females than on males. Chlamydial infections may remain silent [6]. In men, *C. trachomatis* is the most common agent of nongonococcal urethritis, particularly serovars D and K and may cause epididymitis-orchitis, prostatitis, and sperm tract obstruction, in this way, impairing male fertility [7]. When *Chlamydia trachomatis* incubated with human spermatozoa in vitro, it seems to impair sperm motility, and cause premature death, perhaps as an effect of the chlamydial lipopolysaccharide [8]. There is evidence that an infection by trachomatis is related to the production of antisperm antibodies (ASA) that may affect fertility [9]. Also, an infected male partner, even if asymptomatic may transmit the infection to his female partner [10]. Also, results of human and animal inoculation studies support the notion that ureaplasmas are a cause of nonchlamydial and nongonococcal urethritis (NGU) in men [11]. According to a study, overnight incubation with *Mycoplasma hominis* can produce small but statistically significant differences in motility, morphology, and fertilization potential in human spermatozoa [12]. In addition, *Urea plasma urealyticum* is associated with the production of reactive oxygen species [13].

*Escherichia coli* are the most common cause of nonsexually transmitted epididymo-orchitis and are involved in the 65–80% of total acute or chronic prostatitis cases. *E. coli* may, therefore, be implicated in the genesis of infertility [14].

## 2.2. Viral infections

Adverse semen analysis parameters (poor sperm count and reduced motility) have been reported in infertile patients with positive herpes simplex virus (HSV) in semen. These adverse parameters were reversed after initiation of antiviral treatment [15].

Human papilloma virus (HPV) was found in testicular biopsies of azoospermic men, and when present inside sperm cells, they may be related to impaired sperm motility and asthenozoospermia [16]. It was found that there is an association between HPV and infertility, particularly between the presence of these agents and tubal factor infertility that cause a sort of infertility [16]. HIV may impair semen production by itself and certainly deteriorates the outcome of concomitant genital infections; in addition, the specific anti-HIV therapies can cause serious effects on the male reproductive system [17].

## 2.3. Fungal infections

*Candida albicans* commonly colonizes the urethra. It can be found in the semen and may affect in vitro fertilization. *C. albicans* has an inhibitory effect on human sperm motility and impairs the ultrastructure of human spermatozoa, which could be associated with male infertility [18].

## 2.4. Protozoa infections

*Trichomonas vaginalis* is a common parasite of the male genital tract. The organism can, in rare cases, cause a nongonococcal urethritis, prostatitis, and other genital tract disorders. Proteinases released by *T. vaginalis* can also inhibit sperm motility in vitro, even after the microorganism has been removed from the culture medium [19].

## 3. Prevalence of infection in infertile males.

Infections of male genital urinary tract account for about 15% of the case of male infertility. Different sites can be affected in the male reproductive system, such as the testis, epididymis, and male accessory sex glands. Spermatogenesis itself can be affected by urogenital infections at different levels of development, maturation, and transport of spermatozoa [3].

Leucocytospermia has been reported among 10–20% of infertile male patients. Twenty-five percent of patients with abnormal semen function have been proved to have antibodies to *C. trachomatis* [5–9, 20].

## 4. Mechanism by which genital tract infection can cause infertility

Infection may affect male fertility in different ways, including impairment of spermatogenesis, induction of autoimmune mechanisms, obstruction of the ejaculatory ducts, dysfunction of the ejaculated sperms, decrease in the motility of the spermatozoa, and induction of reactive oxygen species (ROS) [4–12].

## 5. Fertility preservation by early diagnosis and treatment of sexually transmitted disease

The organisms involved in sexually transmitted diseases (STDs) can be diagnosed nowadays with accuracy by the polymerase chain reaction (PCR) technique using the primer pairs that are specific for each organism. This gene amplification technology can amplify the DNA of the organism in any sample up to 1 million fold in few hours. The traditional approaches like the in vitro culture system or the DNA hybridization techniques are less accurate than the gene amplification technique [21].

## 6. Future perspectives

The preventative screening campaign can be effective in reducing the incidence of infection-related infertility. On the horizon, chlamydial and gonococcal vaccines may be seen in the near future [21].

## 7. Conclusion

Infectious agents can affect fertility in male. This can be done through different mechanisms. They can cause inflammation in different parts of male genital tract and affect sperm count, motility, and quality.

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