

Chlamydia Trachomatis: An Important Sexually Transmitted Disease in Adolescents and Young Adults

Donald E. Greydanus, MD, and Elizabeth R. McAnarney, MD
Rochester, New York

Chlamydia trachomatis is being recognized as an important sexually transmitted disease in adolescents and young adults. This report reviews the recent literature regarding the many clinical entities encompassed by this organism; this includes urethritis and cervicitis as well as epididymitis, salpingitis, peritonitis, perihepatitis, urethral syndrome, Reiter syndrome, arthritis, endocarditis, and others. It is emphasized that many aspects of chlamydial infections parallel those of gonorrhea, including incidence, transmission, carrier state, reservoir, complications, (local and systemic), and others. A paragonococcal spectrum of sexual chlamydial disorders is discussed as well as effective antibiotic therapy. This microbiological agent must always be considered if venereal disease is suspected by the clinician in teenagers or adults. Mixed infections with Chlamydia trachomatis and Neisseria gonorrhoeae are common in both males and females. It may be preferable to treat gonorrhea with tetracycline to cover for this possibility.

Recent reviews¹⁻³ have implicated Chlamydia trachomatis as a *major* cause of sexually transmitted disease (STD) in young adult and presumably adolescent populations in the Western world. The chlamydiae (previously called "Bedsonia") are obligate intracellular parasites requiring tissue culture techniques (as McCoy cells) for culture and isolation. Two species are recognized: Chlamydia psittaci (causing psittacosis) and Chlamydia trachomatis (which consists of different subspecies, which are immunologically and epidemiolog-

ically distinct, causing "nonspecific" urethritis or cervicitis, trachoma, and lymphogranuloma venereum).

Chlamydia trachomatis infections have been categorized with herpesvirus and cytomegalovirus infections as a group of sexually transmitted diseases which can be passed from mother to fetus with resultant early disease in infancy.⁴ Perhaps as many as 15 percent (or more) of pregnant urban women are infected with this organism, causing inclusion conjunctivitis in 50 percent and pneumonia in 20 percent of the infants.^{4,5} It is the purpose of this paper to emphasize that Chlamydia trachomatis should also be categorized with N gonorrhoeae by the clinician who treats teenagers. For this sexually transmitted disease appears to be *as important* a venereal disease as gonorrhea in its incidence, transmission, range of infected

From the Division of Biosocial Pediatrics and Adolescent Medicine, Department of Pediatrics, University of Rochester School of Medicine and Dentistry, Rochester, New York. Requests for reprints should be addressed to Dr. Donald E. Greydanus, Division of Biosocial Pediatrics and Adolescent Medicine, Department of Pediatrics, University of Rochester School of Medicine and Dentistry, 601 Elmwood Avenue, Rochester, NY 14642.

Table 1. Comparison Between *C trachomatis* and *N gonorrhoeae* as Venereal Disease Agents

Subject	<i>Chlamydia trachomatis</i>	<i>Neisseria gonorrhoeae</i> ³⁶
1. Organism	Obligate intracellular parasite	Gram-negative diplococcus often found within cells (as leukocytes on Gram stain)
2. Transmission	Venereal	Venereal
3. Incubation period	8-21 days	2-6 days (can be longer, as long as 10-16 days in rare cases)
4. Major infection	Urethritis (males). Cervicitis	Urethritis (males). Cervicitis
5. Local complications	Yes: epididymitis, Bartholinitis, urethral syndrome, salpingitis, others	Yes: same, and others, including prostatitis
6. Systemic complications	Possibly; arthritis, perihepatitis, peritonitis, and endocarditis reported	Well known; gonococcal septicemia, with resultant arthritis, dermatitis, endocarditis, and meningitis; perihepatitis and peritonitis also reported
7. Pharyngitis	Yes	Yes
8. Conjunctivitis	Yes	Yes
9. Proctitis	Cultured from the rectum, infection not yet documented	Yes; common venereal infection in homosexual individuals
10. Maternal infection with resultant effect on newborn or infant	Well known: inclusion conjunctivitis and pneumonia	Less well established
11. Carrier state	Recognized, especially in women can last for months	Recognized, especially in women can last for months
12. Reservoir	Cervix (male urethra a minor role)	Cervix (male urethra a minor role)
13. Treatment	Tetracycline the antibiotic of choice. Erythromycin, sulfonamides, streptomycin, and trimethoprim-sulfamethoxazole also effective. Regimen of 14 days often used	Current CDC recommendation involves procaine penicillin, ampicillin, amoxicillin, tetracycline, or spectinomycin; probenecid used; shorter treatment regimen
14. Treatment of sexual contacts	Yes	Yes

sites, prolonged carrier state, and in other ways (Table 1).

Chlamydia trachomatis has been noted to cause a variety of disorders, including male urethritis, cervicitis, epididymitis, salpingitis, peritonitis, perihepatitis (Fitz-Hugh-Curtis syndrome), urethral syndrome, Reiter syndrome, arthritis, phar-

ngitis, conjunctivitis, otitis media, pneumonia, endocarditis, and others. This list is ever expanding, along a line similar to the spectrum of gonorrhea (Table 1). It has been cultured from the rectum but not yet established as a cause of proctitis (as has gonorrhea). Although *N gonorrhoeae* is a well-established cause of prostatitis, *Chlamy-*

Table 2. Causes of Male Urethritis

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| 1. | <i>Neisseria gonorrhoeae</i> |
| 2. | <i>Chlamydia trachomatis</i> |
| 3. | <i>Ureaplasma urealyticum</i>
(T-strain <i>Mycoplasma</i>) |
| 4. | <i>Mycoplasma hominis</i> |
| 5. | <i>Trichomonas vaginalis</i> |
| 6. | <i>Haemophilus vaginalis</i>
(<i>Corynebacterium vaginale</i>) |
| 7. | <i>Candida albicans</i> |
| 8. | ? Herpes simplex virus |
| 9. | ? Cytomegalovirus |

ia trachomatis has not been shown to infect the prostate.⁶ Heterosexual and homosexual youth are infected as well as various ethnic groups.

The diagnosis of the infection is based on positive culture reports and/or the presence of genital chlamydial antibody production.⁷ A new micro-immunofluorescence test may facilitate rapid diagnosis.⁸ This would be very helpful, as most laboratories do not have the capability of culturing this organism.

The two main infections identified with sexually transmitted *Chlamydia trachomatis* (serotypes D,E,F,G,H,I,J, and K) are urethritis in males and cervicitis.

Urethritis (Males)

This is the most commonly documented site, being identified as the cause of 30 to 50 percent of nongonococcal urethritis, 60 to 70 percent of post-gonococcal urethritis, and 30 to 40 percent of urethritis for which *N gonorrhoeae* is also a causative agent.⁹⁻¹⁴ At least one third of female consorts of males infected with *C trachomatis* have positive cervical cultures for this organism. The incidence in asymptomatic males is low.¹⁵

Dysuria with a mucoid or mucopurulent urethral discharge develops one to three weeks after coitus with an infected partner. Comparison with gonococcal urethritis indicates a greater tendency for dysuria with *C trachomatis* as well as a more

mucoid discharge and a longer incubation period. However, a clear, white, or even overtly purulent urethral discharge may also be observed. Mixed infection may produce two symptom complexes, in which first the gonococcal urethritis develops within two to six days of sexual contact, and then the chlamydial urethritis develops several days later. Leukocytes (over 20 per 400×field) may be noted in the first 15 cc of voided, uncentrifuged urine. A Gram stain of the urethral exudate is not helpful, since it does not detect the *C trachomatis* organism.

Other causes of male urethritis are listed in Table 2.^{9,16,17} Lee et al¹⁶ reports that white heterosexual males are the group more likely to develop nongonococcal urethritis (ie, *C trachomatis*) than gonococcal urethritis, and to have a urethral colonization with *Ureaplasma urealyticum* (T-strain *Mycoplasma*).

Treatment consists of oral tetracycline hydrochloride, 1 to 2 gm per day for at least 14 days.^{12,18} Various tetracycline regimens have been used from one to three weeks and even longer. Doxycycline (100 mg twice a day) or erythromycin stearate (1 gm per day) have also been used for one- to three-week periods. Treatment is important to relieve symptoms, reduce the chance of sterility, reduce the reservoir for organisms in the urethra, and prevent venereal transmission. Treatment of the sex partner(s) is also necessary.¹⁹ Recurrence rates of 40 percent occurring within six weeks for nongonococcal urethritis are noted, and are due to many factors (Table 3).¹²

Table 3. Factors in the Recurrence of Non-Gonococcal Urethritis in Males

1. Reinfection with *C trachomatis*
2. Infection with *Ureaplasma urealyticum*, *Trichomonas vaginalis*, *Candida albicans*, or possibly other agents
3. Cystitis or urinary tract infection
4. Urethral stricture
5. Urethral foreign body
6. Urethral trauma (from excessive coital activity or constant "milking" of the urethra to observe for discharge)

Cervicitis

Chlamydia trachomatis is an increasingly recognized cause of cervicitis.^{20,21} As many as 30 percent of women presenting to a venereal disease clinic have a positive chlamydial culture in the absence of other sexually transmitted organisms. In addition, 60 percent of women with gonorrhea also have *C trachomatis*.² *C trachomatis* is noted in one to seven percent of controls (ie, non-venereal disease clinic patients).

Evidence of infection includes erythematous vaginal mucosa, hypertrophic cervical erosion, purulent or mucopurulent cervical discharge, and abnormal Pap smears (Class IIB and III).²²⁻²⁴ No specific clinical pattern has been noted and there is no correlation with ethnic history, contraceptive methods, phase of menstrual cycle, or number of sexual contacts. Mixed infections are common, as are asymptomatic cases in sexually active women. The cervix is an important reservoir source, and a carrier state of at least several months has been recognized.²⁵

Treatment with oral tetracycline for 14 days or more has been associated with disappearance of symptoms and reversal of abnormal Pap smears to Class I.^{3,24} Also effective is doxycycline, erythromycin stearate, sulfonamides, streptomycin, and trimethoprim-sulfamethoxazole. *Ineffective* antibiotics include penicillin (intramuscular or oral), ampicillin, amoxicillin, metronidazole, and the cephalosporins.²² Treatment of sexual partner(s) is

important. Tetracycline therapy of all patients with gonorrhea may be necessary, due to the high rate of mixed venereal infections.

Other Chlamydia Trachomatis Infections

Bartholinitis²⁶ and the urethral syndrome²⁷ have been recently reported. The latter was characterized by frequency and dysuria in association with a urethral discharge, edema of the urethral walls, and cervicitis. A three-week course of oxytetracycline was effective. The importance of *C trachomatis* in acute salpingitis is under close observation since Mårdh's report²⁸ in 1977, in which this organism was isolated from the cervix in 19 of 53 cases of salpingitis and from the Fallopian tubes in 6 of 20 salpingitis cases. This same Swedish group of investigators have implicated *Chlamydia trachomatis* in 66 percent of 143 cases of pelvic inflammatory disease cases, on the basis of chlamydial antibody studies.²⁹ They noted that the antibody titer correlated with the severity of the salpingitis symptoms. In addition, Muller-Schoop et al³⁰ have implicated it in several cases of peritonitis and perihepatitis in women.

The report of Heap³¹ in 1975 identifying it in two cases of acute epididymitis further strengthened the concept that sexually transmitted chlamydial infections follow a paragonococcal spectrum. Berger et al,³² in 1978, isolated this agent in 11 of 13 cases of epididymitis and concluded that it is the

main cause of nongonococcal epididymitis in males under age 35 years.

Keat et al³³ have reported *C trachomatis* as the cause of 36 percent of arthritis due to sexually active agents. It may be a cause of some cases of Reiter syndrome,³⁴ though no association with HLA-B27 histocompatibility antigen is noted. Finally, a case of *C trachomatis* endocarditis in a 25-year-old pregnant woman has been recently reported in which the patient died after a short, fulminating course.³⁵

Summary

Recent studies have noted that *C trachomatis* is a very important factor in sexually transmitted diseases in high-risk individuals, such as teenagers. The spectrum of disorders seems to parallel that of *N gonorrhoeae* in many, but not all facets.³⁶ Clinicians treating teenagers should be aware of this newly recognized sexually transmitted disease. Treatment of urethritis in males, cervicitis, salpingitis, epididymitis, and other infection sites should include the possibility of *C trachomatis*. In some cases it may occur with *N gonorrhoeae*, or even other venereal disease agents.

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