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# CHLAMYDIAL INFECTIONS



**STD/HIV**  
Prevention  
Training  
*Center of New England*

A Project of the Division of STD Prevention  
Massachusetts Department of Public Health  
Funded by the CDC



# CHLAMYDIAL INFECTIONS

## OBJECTIVES

### CHLAMYDIAL INFECTIONS

1. Define the epidemiologic and clinical manifestations of uncomplicated chlamydial infections in women and men.
2. Describe the different laboratory methods available for the diagnosis of chlamydial infections and their respective sensitivity and specificity, advantages and disadvantages.
3. Discuss appropriate screening.
4. List the recommended treatment for uncomplicated chlamydial infections in women and men, and describe their indications and contraindications.
5. List the complications associated with chlamydial infections.
6. Describe the management of sexual partners of persons infected with chlamydia.
7. Summarize the clinical manifestations of chlamydial infections in the neonate.
8. Describe clinic and community-based strategies for chlamydia prevention.

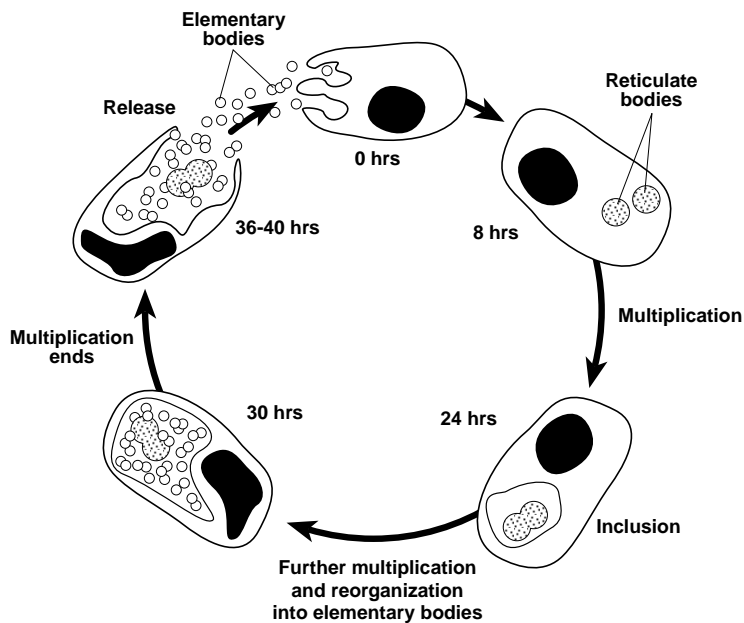
# 1.0 CHLAMYDIAL INFECTIONS: BIOLOGY

*Chlamydia trachomatis* is a member of the Chlamydiaceae family. It is an **obligate intracellular bacterium**, has DNA & RNA, bacterial ribosomes, a gram-negative-like cell wall, and is **susceptible to antibiotics**.

CLASSIFICATION IS AS FOLLOWS:

Species (genus)	Serovar	Disease
<i>C. trachomatis</i> <i>2 biovars</i>	<i>non LGV</i> A, B, Ba, C D → K	Trachoma NGU, MPC, PID, etc.
	<i>LGV</i> L <sub>1</sub> , L <sub>2</sub> , L <sub>3</sub>	LGV
<i>C. pneumoniae</i>		Pharyngitis, bronchitis, pneumonia
<i>C. psittaci</i>		Psittacosis

It has a unique life cycle that requires 36 to 48 hours: phagocytosis of elementary bodies (EB: infectious particles) by the cell, formation of reticulate body, multiplication to form inclusion body, reorganization into elementary bodies, cell rupture and release of elementary bodies.



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## 1.1 PATHOGENESIS

*C. trachomatis* infects the superficial mucosa (squamocolumnar and columnar epithelial cells). It must parasitize eukaryotic cells to reproduce. Therefore, culture of the organism requires cellular material. The infection is often chronic (months to years).

Immune response to the organism is strong, and it is now believed that part of tissue damages (mainly scarring) resulting from chlamydial infections are due to an immunological or hypersensitivity mechanism.

## 1.2 EPIDEMIOLOGY

### INCIDENCE IN THE USA

Chlamydia trachomatis is the most frequently reported notifiable STD in the USA. In 1999, 659,441 chlamydial infections were reported: This represents almost twice the number of reported gonococcal infections for the same year.

Rates have been steadily increasing in the USA since the early 1990's. This is likely due to increased screening, enhanced reporting and to using more sensitive laboratory detection tests (amplified tests).

Rates of chlamydial infections in women are four times higher than rates in men: This most likely reflects more intense screening in women. With the arrival of highly sensitive amplified technology which allows for non-invasive screening (urine) of males, it can be anticipated that rates in men will more steeply increase in the future due to enhanced screening and that this increase will be proportionately higher in men than women. In fact, whereas rates in men were relatively stable from 1990 to 1996, they have steadily risen since 1997, about the time that amplified tests became available.

Rates are highest among the 15-24 year olds, with the highest rates among the 15-19 age group.

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### PREVALENCE IN THE USA

The prevalence of chlamydial infections will vary according to the setting, 11 % in women aged 16-24 entering the US Job Corps, 10% for women aged 17-37 entering the US Army and 13% for adolescent women entering juvenile

#### KEY POINTS:

Chlamydia is the most common reportable STD in the US  
More geographic distribution than gonorrhea or syphilis  
Rates highest in adolescent women

detention centers. In general, higher rates are seen in STD clinics (10-25%) and lower rates among HMO members (2-5%). The prevalence of female chlamydial infections have decreased in family planning clinics that have instituted a screening program many years ago (such as Region X). Overall, in 1999, the median prevalence of chlamydial infections in women aged 15-24 presenting at family planning clinics in the USA was 5.5% (range 2.6% to 15.0%).

Population-based studies have demonstrated prevalences of male asymptomatic chlamydial infections varies between 3% and 9%, depending on the setting, with higher rates among incarcerated youths.

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## TRANSMISSION AND INCUBATION

Transmission was initially thought to be more effective from infected man to woman (25%). Recent studies done with the polymerase chain reaction (PCR) technology have demonstrated that **transmissions rates are probably similar between genders**. Orogenital contact is inefficient for transmission of chlamydial infections.

The incubation period for non gonococcal urethritis is 1-5 weeks, with a peak at 1-3 weeks. Because many women are asymptomatic, the incubation period is difficult to assess.

**Asymptomatic carriers are an important reservoir for transmission.**

## 1.3 CLINICAL MANIFESTATIONS

The following describes the clinical manifestations of chlamydial infections in men, women and children. **It is important to note that up to 75% of women and 60% or more of men are asymptomatic of their infection.**

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### UNCOMPLICATED INFECTIONS

#### A. NON-GONOCOCCAL URETHRITIS (SEE ALSO SECTION 6)

It is estimated that more than 2 million cases of NGU occur annually in men in the United States. The incidence of NGU has been stable for several years. **With declining gonorrhea rates, NGU has become more frequent than gonococcal urethritis.** In some settings, the role of *C. trachomatis* as etiologic agent in NGU has decreased.

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Clinical manifestations:

- ä **In men:** discharge (often mucoid rather than frankly purulent), dysuria and pruritis. Frequency and urgency is less common. Urethral discharge is present on examination. However, in men, chlamydial urethritis is often asymptomatic.
- ä **In women:** (often called the "urethral syndrome"), symptoms similar to those of a urinary tract infection (UTI). Urine cultures fail to identify any bacteria, but pyuria is present. It can also be asymptomatic and is a frequent site of infection (60% to 80%). A positive culture or nonculture test for CT of the cervix, urethra or urine is diagnostic. Patients are usually symptomatic for more than 7 days when they present.

NGU in men is defined on the **gram stain** of a urethral specimen by the presence of  **$\geq 5$  PMNs** per high power field (oil immersion 1000 x) **in the absence of gram negative intracellular diplococci** or on the examination at 400x of a **sediment of first voided urine** by the presence of  **$\geq 10$  PMNs, or a positive leukocyte esterase test.**

**NOTE:** *C. trachomatis* has been isolated in asymptomatic men in the absence of findings on the gram stain and in the absence of pyuria. Therefore, a negative gram stain or negative urine sediment/leukocyte esterase test does not rule out a chlamydial infection in men.

#### B. BARTHOLINITIS

*C. trachomatis* can be the only agent isolated in cases of batholinitis, or may be associated with a gonococcal infection. The symptoms are the same as those described for gonococcal infection.

#### C. CERVICITIS

The cervix is the most common site (75% to 80%) of infection in women, and about 30 to 50% have specific signs of mucopurulent cervicitis. These signs and symptoms are the same as those described in the gonorrhea section, (see also section 6 on syndromal approach to STDs). **Most women are asymptomatic of their infection.** MPC is characterized by a purulent or mucopurulent endocervical exudate, visible in the endocervix or in an endocervical swab specimen (positive swab test). Some experts also make the diagnosis on the basis of early induced cervical bleeding. **The increased number of PMNs on the gram stain is no longer considered a required criteria for diagnosis as it has poor predictive value and has not been standardized.**

#### KEY POINTS:

Asymptomatic infection is common in both men and women  
 Chlamydia and gonorrhea can infect the same anatomic sites, but symptoms tend to be milder with chlamydia  
 Clinically differentiating GC from CT is inaccurate, so laboratory confirmation is recommended

**D. ANORECTAL INFECTION**

Associated with discharge and pain, but if caused by non LGV strains, usually mild. The anoscopy is abnormal (mucopurulent d/c, spontaneous or induced bleeding). A rectal gram stain with  $\geq 1$  PMN without GNID is presumptive of diagnosis, and a positive culture or DFA for CT is diagnostic. Site of infection in 25% of female cases associated with cervical infection.

LGV can cause acute proctocolitis associated with rectal pain, discharge, hematochezia, and sometimes fever and lymphadenopathy. A markedly abnormal anoscopy is often noted, with lesions extending into the colon. Strictures can also occur. A rectal gram stain with  $\geq 1$  PMN per HPF w/o GNID is presumptive of diagnosis. A positive culture or DFA for CT or a complement fixation antibody titer  $\geq 1:32$  is diagnostic.

**E. CONJUNCTIVITIS**

Can occur as a result of autoinoculation in adults, and can cby passage through an infected birth canal for neonates. The conjunctiva often has a granular appearance and the secretions in the adult are not purulent. Can cause purulent conjunctivitis in the neonate 5 to 12 days after delivery.

Oral treatment with the same recommended regimen as for genital infections is required.

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**COMPLICATED INFECTIONS****A. PROSTATITIS**

Role of CT in this entity advocated by some but not yet proven (controversial)

**B. STD RELATED EPIDIDYMITIS**

Clinical manifestations are similar to those described for NG: epididymal/testicular pain, epididymal tenderness and mass on exam.

**35-65% (average 50%)** of STD related **epididymitis** in **heterosexual** men is due to **C. trachomatis**, the rest being attributed to GC. Some cases may be caused by both pathogens. Overall, it is an uncommon complication, occurring in less than 2% of chlamydial infections. The presence of  $\geq 5$  PMNs per HPF in the absence of GNID is presumptive of CT epididymitis, and a positive test for CT from the urethra or the epididymal aspirate is

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diagnostic. In men who engage in rectal intercourse, mainly MSM, epididymitis is more often due to *Escherichia coli* or GC.

Epididymitis can be caused by non STD pathogens, mainly *E. coli* and *pseudomonas*. These infections occur more commonly in men over the age of 35. The urethral gram stain will not show any PMNs, but the urinalysis will show an increase in PMNs and a positive urine culture.

Sterility in men caused by chlamydial infections is unproven.

### C. REITER'S SYNDROME

The syndrome is mainly seen in men, is associated with HLA-B27 and with specific immune response. Risk is 1 to 3% for NGU. It is a post-chlamydial immunologic response syndrome.

It is characterized by the classic triad of urethritis, arthritis and conjunctivitis. Skin lesions can also be present, as well as keratodermia blennorrhagica and circinate balanitis. There is increasing evidence of chlamydia in joint fluid and synovium by PCR and DFA. Other organisms, such as *Shigella flexneri*, *Salmonella*, *Yersinia* and *Campylobacter* have been associated with Reiter's syndrome.

Most cases will resolve completely within 2 to 6 months, but can last more than one year. Recurrences can also occur.

### D. PELVIC INFLAMMATORY DISEASE (PID)

(See also Section 6 for evaluation and management of PID)

The time required for spread from cervix to upper track still unclear. The symptoms are generally milder than those described for PID caused by GC. **Can cause "silent PID", but still associated with sequelae of infertility and higher risk of ectopic pregnancy.** In many settings, **CT is the major cause of PID.**

### E. PERIHEPATITIS (FITZ-HUGH-CURTIS SYNDROME)

**70% of cases are associated with CT.** PID may not be always clinically evident. Although thought to be caused generally by direct spread of the organism from the infected fallopian tubes to the capsule of the liver, hematogeneous and lymphatic spread may also occur. High titer IgM or IgG antibody to *Chlamydia trachomatis*.

### F. NEONATAL INFECTIONS

**Nearly  $\frac{2}{3}$  of neonates born to infected mothers will develop a chlamydial colonization after delivery.** Between 15% to 37% of

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colonized newborns will develop conjunctivitis, and 11% to 20% will develop pneumonia.

Studies have demonstrated that **ocular prophylaxis does not prevent infection to the newborn**, with 15% to 25% of infants exposed to CT developing conjunctivitis. Furthermore, prophylaxis aimed at the eye will fail to prevent direct infections or colonization by CT at other sites such as the vagina, rectum, oropharynx, nasopharynx and lung.

Conjunctivitis due to *C. trachomatis* is the most common cause of neonatal ophthalmia, and develops 5 to 12 days after birth. Conjunctival cells (not just exudate) should be present on specimens being tested. Culture and non culture tests can be used. The Giemsa stain is specific for CT, but not sensitive.

Subacute, afebrile pneumonia due to CT develops generally at age 1 to 3 months, and is characterized by repetitive staccato cough with tachypnea, hyperinflation and bilateral diffuse infiltrates on a chest roentgenogram. Wheezing is rare and peripheral eosinophilia is sometimes observed. Culture remains the definite standard for nasopharyngeal specimens. If non culture tests are used, it must be kept in mind that these tests are not as sensitive and specific as tissue cultures. An acute IgM MIF antibody test for CT of 1:32 or higher is highly suggestive of CT pneumonia.

Emphasis should be to detect chlamydial maternal infection and adequately treat before delivery, to prevent neonatal infections.

## 1.4 LABORATORY DIAGNOSIS

Specimen collection is crucial to optimize the performance of any chlamydial detection test, particularly if the cervix is the site being tested. Because *Chlamydia trachomatis* infects columnar epithelial cells, a specimen containing only pus, exudate or squamous epithelial cells is not adequate. The specimen must contain columnar epithelial cells after correct sampling of the endocervix. Urine testing provides a new approach to testing genitourinary sites, which circumvents crucial collection procedures, although the first 10 to 15 cc of urine should be used.

As a rule, non-culture tests should not be used to diagnose chlamydial infections in prepubertal children past the neonatal period. Because of the potential of criminal investigation and legal proceedings for child sexual abuse,

### KEY POINTS:

Amplified nucleic acid tests are currently the most sensitive laboratory methods for the detection of *Chlamydia trachomatis*. Urine specimens can also be used with these new technologies.

Rapid in-office tests do not, as of yet, offer an adequate sensitivity and so are not currently recommended.



diagnosis of CT in prepubertal children requires the high specificity of tissue cultures. Non culture tests may be falsely positive because they can cross-react with *C. pneumonia* in specimens taken from the respiratory system or the fecal flora in genital and anal specimens. Data are insufficient to adequately assess the utility of nucleic acid amplification tests in the evaluation of children who might have been sexually abused, but expert opinion suggests that these tests may be an alternative if confirmation is available and culture systems for *C. trachomatis* are not available.

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## CULTURE

Because *C. trachomatis* is an intra-cellular parasite, cell cultures are required to grow the organism. Adherence to transport requirements (immediate refrigeration after immersion in SP transport medium if can reach the lab within 12-18 hours or -70C if longer storage is anticipated - never store at -20C) is crucial for optimal sensitivity. Swabs with wooden shafts should be avoided as they can be toxic to CT.

Its gold standard status is being challenged because of its low **sensitivity (40% to 85%)**. Expanded gold standards are now being used to study new technologies. Theoretically **100% specific**, and still recommended as detection method for medical legal cases, particularly pediatric. Can be used for all anatomical sites.

### In males and females:

sensitivity 40-85%

specificity 100%

### Advantages:

100% specific

Recommended detection method in medical legal cases, particularly in pediatric cases

Can be used for all anatomical sites

### Disadvantages:

Requires rigorous transport conditions

Live organisms are needed to grow in cell culture

Expensive and difficult

Not widely available

Low sensitivity

### NOTES:

## ANTIGEN DETECTION METHODS (DFA, EIA)



These tests detect organisms by immunologic means. **They are not approved for all anatomical sites.** For rectal specimens, culture is the preferred method of detection for CT. Some DFA tests have been approved, but should be done only if highly experienced microscopists will read the slides. For nasopharyngeal (neonates) specimens, culture is the preferred choice. Nonculture tests may be used, bearing in mind that they are less sensitive and specific than cultures. Cross reaction with *Chlamydia pneumoniae* can occur. The sensitivity range for these tests is 60 to 75%.

**DFA:** specimen is smeared onto a glass slide provided by the manufacturer, allowed to air dry, fixed in methanol, and sent to the laboratory. Specific monoclonal fluorescein-labeled antibody is applied and binds with chlamydial particles. The slide is read under a fluorescence microscope. Chlamydial particles (elementary bodies) will appear as small, round and apple green. It is the only method that can assess for adequacy of specimen collection.

**In males and females:**

sensitivity 70-90%

specificity >99%

**Advantages:**

Specific

Can be used for anal specimens if read by experienced microscopist

Can test for specimen collection adequacy (presence of cells)

Some tests approved for rectal specimens

**Disadvantages:**

Time consuming

Requires expensive fluorescent microscope

Requires experienced microscopist

**EIA:** the specimen is inserted in transport medium provided by the manufacturer. CT particles present in the specimen will adhere to antibody coated beads. Enzyme linked antibody binds to the complex. A color developer is added. The intensity of the color is proportional to the quantity of CT antigens adsorbed to the beads. Cross reaction can occur with other organisms (*Acinetobacter*, *E. coli*, *Salmonella* spp, *Klebsiella* spp, *Gardnerella vaginalis*, group A Streptococci). For this reason, a blocking assay was developed. The specificity with the blocking



assay exceeds 99%. This assay consists of adding monoclonal antibody specific to chlamydial LPS to positive specimens and repeating the test. If CT is present, the monoclonal antibody competitively inhibits binding by the enzyme linked antibody. A 50% or greater reduction of absorbance of the blocked assay confirms the presence of CT. They can be done in batches.

**In males and females:**

sensitivity 60-85%

specificity 99% (with blocking assay)

**Advantages:**

Can be done in batches

Less expensive than other non culture tests

**Disadvantages:**

Less sensitive

FDA approved only for cervical and urethral sites

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## NUCLEIC ACID TECHNOLOGY

### A. NON AMPLIFIED (DNA PROBE)

A chemiluminescent DNA probe assay binds to a complimentary portion of the 16S rRNA of CT. The resulting DNA:rRNA hybrid is luminescent and detected by a luminometer. A competitive probe assay is available to increase specificity.

**In males and females:**

sensitivity 60% to 80%

specificity 99-100%

**Advantages:**

Specimen is stable at room temperature for 7 days

The same specimen can be used to test for GC and CT (Pace-2)

**Disadvantages:**

Blood may interfere with specificity: false positives with a low level of reactive light unit (RLU) can occur occasionally if the

**NOTES:**



concentration of blood is >8% in a specimen

FDA approved for urethral, cervical and conjunctival sites only

**B) AMPLIFIED (LIGASE CHAIN REACTION, POLYMERASE CHAIN REACTION, AND TRANSCRIPTION-MEDIATED AMPLIFICATION)**

Minute amounts of specific DNA or RNA sequences can be enzymatically amplified to the extent that a sufficient quantity of material is available to reach a threshold "signal" for detection. Occasional false negatives (interference with sensitivity) due to inhibitory factors in cervical specimens, particularly for PCR and often due to the presence of blood, have been described. Dilution of specimens or overnight refrigeration appear to circumvent the problem of inhibitors.

**In males**

urethra: sensitivity 93-99% (LCR) 90-92% (PCR) 93-98% (TMA)

urine: sensitivity 93-96% (LCR) 93-98% (PCR) 93-100% (TMA)

**In females**

Cervix: sensitivity 91-97% (LCR) 89-100% (PCR) 88-99% (TMA)

urine: sensitivity 94-96% (LCR) 97% (PCR) 83-94% (TMA)

Overall specificity at all sites for LCR and PCR is > 99%

**Advantages:**

Most sensitive tests for the detection of CT

Highly specific

Can be used on first voided urine for both men and women

Self-collected vaginal swabs can also be used

**Disadvantages:**

More expensive than other non culture tests

FDA approved only for urine and genital site testing

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## SEROLOGY

**Rarely of value.** High background prevalence and infrequent rises and falls in IgG and IgM. May be useful in selected tissue invasive infections (perihepatitis, LGV, PID and infant pneumonitis). Problems with specificity.

**KEY POINTS:**

Culture has low sensitivity, but 100% specific and can be used for any anatomic site

Antigen detection systems lack in sensitivity

Non-amplified DNA probe less sensitive for CT than GC

Amplified nucleic acid tests new gold standard, highly sensitive, can be used on urines, but not approved for all anatomic sites

For the **diagnosis of LGV, compliment-fixation test** titers of 1:64 or greater (titers of  $\geq 256$  strongly support a diagnosis and titers of  $\leq 32$  rule it out). Can cross react with other chlamydial species (eg CT). The **microimmunofluorescent (Micro-IF) test is more sensitive** than the latter and titers may be very high in the acute phase of LGV, but cross reaction may also occur (although the pattern of reactivity helps to differentiate the serovars).

**SUMMARY PERFORMANCE CHARACTERISTICS FOR LABORATORY TESTS TO DETECT CHLAMYDIA TRACHOMATIS**

**Relative Sensitivity of Laboratory Tests for Chlamydia compared with Resolved Standards**

Population	Specimen Site	Sensitivity (%)					
		DFA	EIA	Probe	Culture	PCR	LCR
Women	Cervix	70-90	60-85	60-75	50-80	70-95	85-95
	Urine	60-70	40-50	?	< 30	90-95	90-95
Men	Urethra	70-85	70-80	70-80	50-80	85-95	85-95
	Urine	60-76	45-85	?	< 20	85-95	85-95
Infant	Conjunctiva	> 90	> 90	?	70-90	>90	> 90

**Sensitivity of non culture Tests for Chlamydia Trachomatis**

Test	Sensitivity (# of elementary bodies required in specimen to test positive)
DFA	$10^4 - 10^5$
EIA	$10^4 - 10^5$
Non amplified DNA probe	$10^4$
Nucleic acid amplification	$\geq 1$

**NOTES:**



## 1.5 TREATMENT

To date, there has been no significant emergence of antibiotic resistance among *Chlamydia trachomatis* strains. Isolated incidents have been reported but need to be substantiated by further epidemiologic studies. Because of the important sequelae associated with chlamydial infections in women (ectopic pregnancy, tubal infertility, chronic pelvic pain), early detection by screening and prompt treatment is warranted. Some women with apparently uncomplicated cervical infections have subclinical upper reproductive tract infections.

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CONSULT THE CDC 1998 GUIDELINES FOR TREATMENT OF STDs FOR COMPLETE INFORMATION



RECOMMENDED TREATMENT FOR UNCOMPLICATED CHLAMYDIAL INFECTIONS IN NON PREGNANT ADULTS

<b>Azithromycin</b>	1 g orally single dose
or	
<b>Doxycycline<sup>1</sup></b>	100 mg orally twice a day X 7days <sup>1</sup>

<sup>1</sup>contraindicated in pregnant women and children under the age of 8

Doxycycline is inexpensive, but requires adherence with a seven day regimen. Azithromycin has prolonged bioavailability, wide tissue distribution, high intracellular concentration, and high activity against CT. However, it is more expensive than doxycycline. In populations with erratic health care seeking behavior, poor drug compliance or little follow-up, there is data suggesting that increased compliance (due to single dose) leads to fewer treatment failures and upper genital tract infections, thus making the use of azithromycin more cost effective.

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### Alternate Regimens

**Ofloxacin**<sup>2</sup> 300 mg orally twice a day X 7 days  
 or  
**Erythromycin** 500 mg orally four times a day X 7 days  
 or  
**EES** 800 mg orally four times a day X 7 days

<sup>2</sup>contraindicated in pregnant women and not approved for children under the age of 18



### RECOMMENDED TREATMENT FOR PREGNANT WOMEN

**Erythromycin** 500 mg orally four times a day X 7 days  
 or  
**Amoxicillin** 500 mg orally three times a day for 7 days

### Alternate Regimens:

**Erythromycin base** 250 mg orally four times a day X 14 days  
 or  
**EES** 800 mg orally four times a day X 7 days  
 or  
**EES** 400 mg orally four times a day X 14 days  
 or  
**Azithromycin**<sup>3</sup> 1 g orally single dose

<sup>3</sup>Published studies since 1997 as well as its extensive use in the community without adverse events suggest that azithromycin is safe and effective to use during pregnancy. However, CDC considers that the data are insufficient to recommend its routine use during pregnancy.

### NOTES:


**RECOMMENDED TREATMENT FOR CHILDREN**
**Children < 45 kg**

Erythromycin base      50mg/kg/day orally divided in four doses for 10-14 days

**Children ≥ 45 kg and < 8 years of age**

Azithromycin      1 g orally single dose

**Children ≥ 8 years of age**

Azithromycin      1 g orally single dose

or

Doxycycline      100 mg orally twice a day for 7 days


**RECOMMENDED TREATMENT FOR NEONATAL INFECTIONS**

**Erythromycin**      50 mg/kg/day orally divided into 4 doses for 10 to 14 days

Oral medication is necessary for conjunctivitis, and topical antibiotic therapy is inadequate. Efficacy of treatment for conjunctivitis and pneumonia is only 80%, and follow-up is necessary to assess resolution. A second course of therapy may be required.

## 1.6 CHLAMYDIA AND HIV

Treatment of Chlamydia infection in HIV-infected individuals does not differ from the standard CDC recommended therapies. Symptomatic genital chlamydia infection has been shown to increase the amount of HIV in genital secretions, theoretically increasing the chance of HIV transmission, so patient education about symptoms of infection and early empiric treatment of symptomatic individuals is important to reduce transmission. Genital chlamydia infection is also thought to increase the susceptibility to HIV infection by increasing the number of target inflammatory cells in the genitals. A recent study has shown that controlling symptomatic STDs in an area with an early HIV epidemic can reduce the number of new HIV infections (ref). It is not clear if asymptomatic infection increases transmissibility of or susceptibility to HIV infection, but the CDC recommends annual screening for chlamydia infection in all HIV-infected individuals, and screening more frequently may be indicated in some situations.

## 1.7 FOLLOW-UP AND PARTNER MANAGEMENT

Routine repeated testing after treatment with doxycycline or azithromycin is not recommended unless symptoms persist or reinfection is suspected. Test of cure (repeat test three weeks after treatment) should be considered if erythromycin or amoxicillin is prescribed, since these medications have a

lower efficacy than doxycycline and azithromycin. **Repeat testing is recommended after treating pregnant women, no matter what regimen is used.**

An accumulating body of evidence suggests that adolescents girls with Chlamydia infection are at high risk for reinfection (estimated to be 15-18% by 6 months), possibly due to re-contact with untreated partners. Since the chance of serious sequelae (infertility, etc.) increase with repeated infections, some experts recommend repeating screening on adolescents every 6 months. New interventions, such as partner-delivered therapy, are under study and may prove to be effective in reducing the number of repeat infections.

Sex partners should be evaluated for STDs, tested and treated for CT if their last sexual encounter with the index patient was within **60 days** of the onset of the patient's symptoms or diagnosis.

Counsel patients to avoid sexual contact until they and their partner have been treated and are asymptomatic, at least 7 days after single dose treatment or after completing the seven day regimen.

## 1.8 SCREENING AND PREVENTION

### Women :

Screening has been proven to reduce the burden of disease in the community and complications in the individual.

The Health Plan Employer Data and Information Set (HEDIS) has developed a chlamydia screening quality indicator: the proportion of sexually active women between the ages of 15 and 25 who are screened annually for Chlamydia trachomatis. HEDIS measures are developed by the National Committee on Quality Assurance (NCQA), the accrediting body of health maintenance organizations (HMOs).

Therefore, annual routine age-based screening for sexually active women aged 25 or less is now recommended by the Centers for Disease Control and Prevention

For adolescent women, more frequent screening, such as every six months, may be appropriate. Urine-based testing should be considered when a pelvic examination is not indicated.

Women who are older than 25 should be screened based on the presence of risk factors, such as: inconsistent use of a barrier method in non mutually monogamous relationships, new sexual partner in the last three months, infection with another STD, multiple sexual partners or the partner has multiple sexual partners or is infected with an STD, drug use or

incarceration.

Pregnant women 25 years or less should be routinely screened early during pregnancy. Because the most significant complication of untreated chlamydial infections in pregnant women is the risk of neonatal transmission, women at risk should also be screened again during the third trimester to insure adequate treatment and reduce the risk of reinfection before delivery. Periodic surveys of chlamydial prevalence can be conducted to confirm the validity of using these recommendations in specific clinical settings.

**Men:**

The CDC recommends screening all sexually active young men annually for chlamydia, but there is little data on the cost-effectiveness of such programs, and HEDIS did not adopt male screening as a quality indicator. Screening programs in youth detention facilities and at high school-based clinics have detected prevalence rates of 3-9% among asymptomatic adolescent males, so it is likely that age-based screening (similar to that for women) may be cost-effective approach. Annual screening of older, high-risk men (incarcerated, illicit drug use, multiple partners, etc.) should also be considered.

The availability of amplified nucleic acid urine-based testing has made screening of asymptomatic men much easier and acceptable to patients. The cost of such testing, though, may be prohibitive for programs needing to screen large numbers on a limited budget. The use of urine leukocyte esterase testing as a screening strategy for men, although much less expensive than amplified nucleic acid testing, is much less sensitive (40-80%) in asymptomatic individuals, so its usefulness is not clear..

## 1.9 REVIEW QUESTIONS

1. Describe the screening strategy for Chlamydial infections in your clinical setting, Which test are you currently using? Do you know the prevalence of *Chlamydia trachomatis* in the population you are serving? Are the current guidelines consistent with the ones recommended in this module? How do you monitor compliance to guidelines?

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2. A 22 year old male comes to your office complaining of mild dysuria. You perform a gram stain that shows no gram negative intra-cellular diplococci (GNID) and 5 PMNs per oil immersion field. Which diagnostic tests for *C. Trachomatis* are likely to be the most sensitive? How would you manage this patient?

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3. What is the most frequent clinical manifestation of *C. trachomatis* in women?

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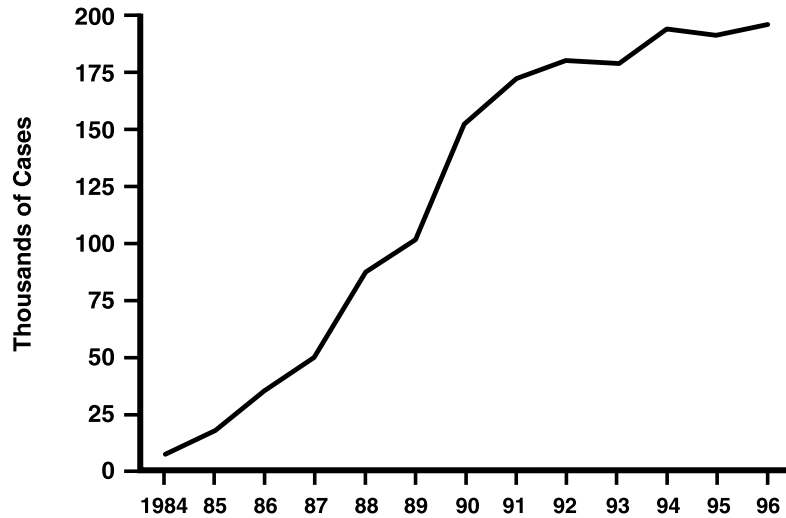
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# 1.10 FIGURES

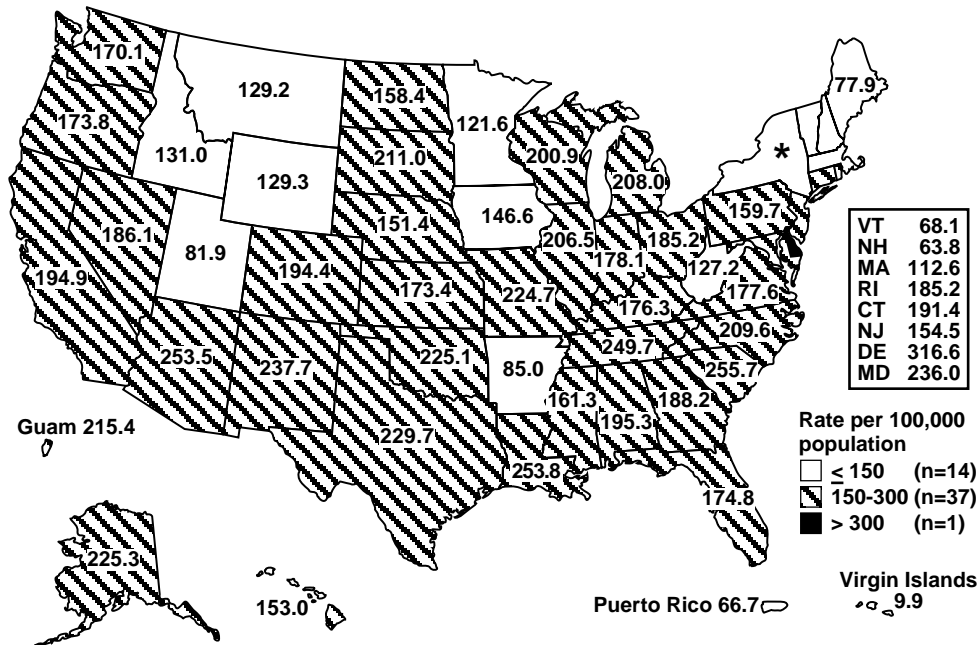
Source: Division of STD Prevention. Sexually Transmitted Disease Surveillance, 1996. USDHHS, PHS. Atlanta: Centers for Disease Control and Prevention, September 1997.

**FIGURE 1: CHLAMYDIA- REPORTED RATES: UNITED STATES, 1984-1986**



Note: For further information on chlamydia reporting see the Appendix.

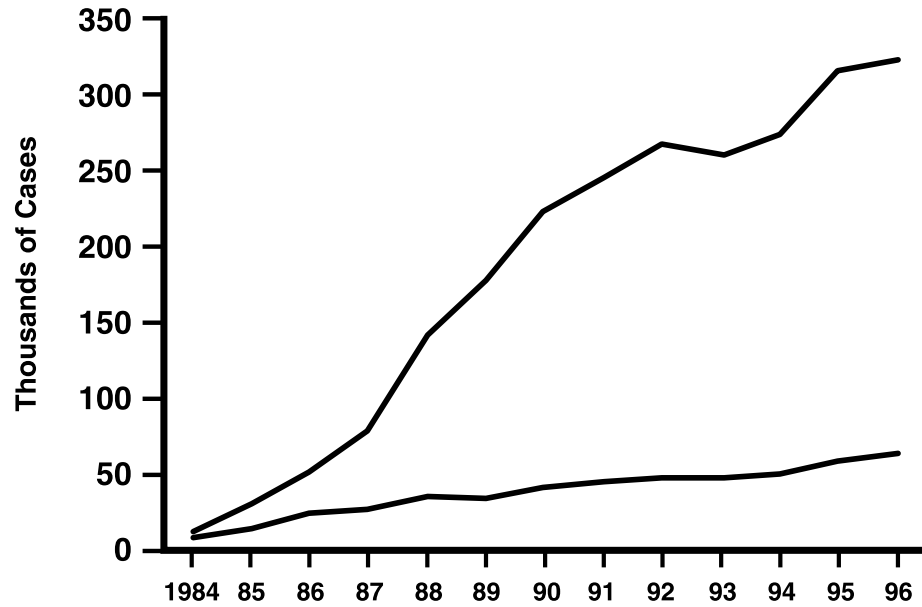
**FIGURE 2: CHLAMYDIA- RATES BY STATE: UNITED STATES AND OUTLYING AREAS- 1986**



\* The New York City rate was 361.8 per 100,000 population. No cases were reported outside of New York City.

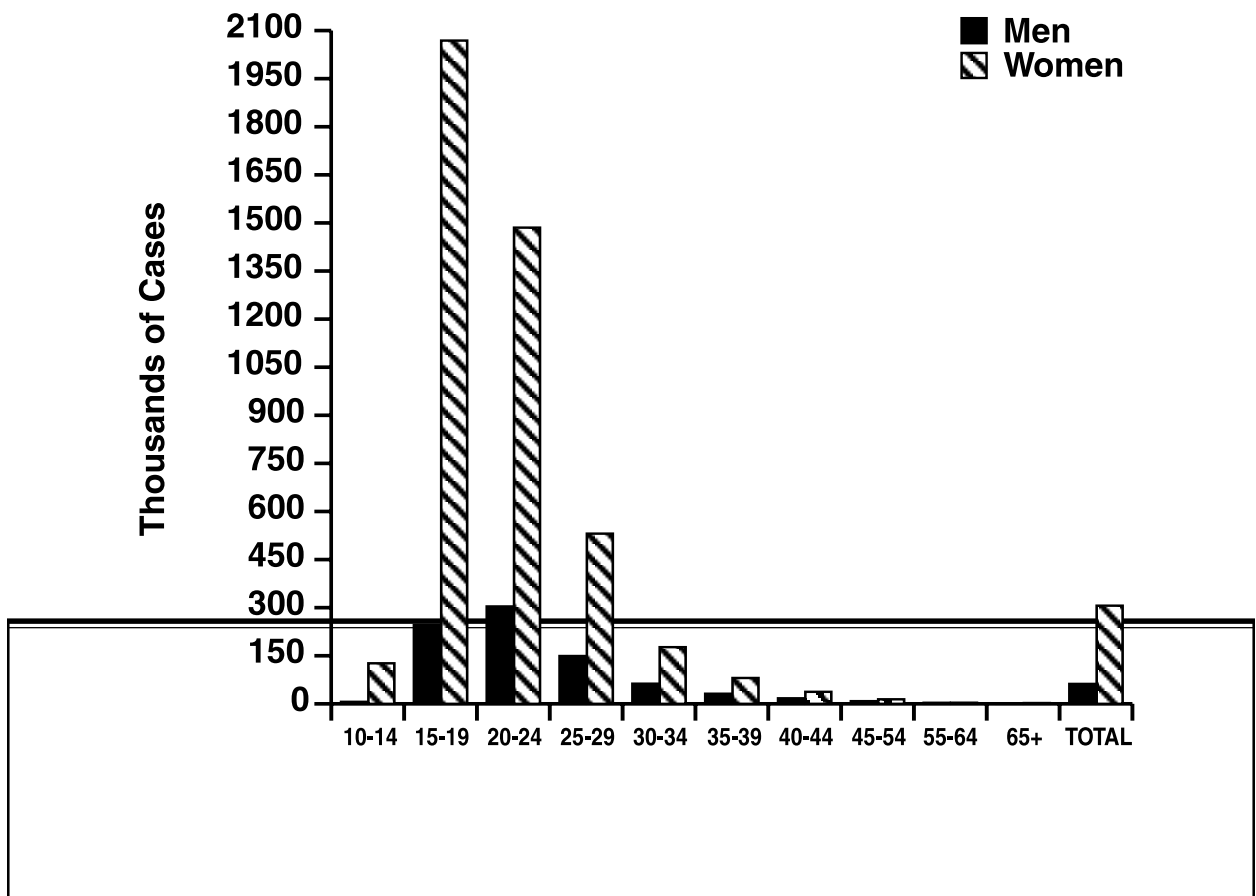
Note: The total rate of chlamydia for the United States and outlying areas (including Guam, Puerto Rico and Virgin Islands) was 192.6 per 100,000 population. For further information on chlamydia reporting see the Appendix.

FIGURE 3: CHLAMYDIA- RATES BY STATE: UNITED STATES AND OUTLYING AREAS- 1986



Note: For further information on chlamydia reporting see the appendix.

FIGURE 4: CHLAMYDIA- AGE AND GENDER-SPECIFIC RATES: UNITED STATES, 1986



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