Chlamydia Module

Target Audience - Faculty in clinical education programs, including those programs that train advanced practice nurses, physician assistants, and physicians

Contents - The following resources are provided in this module:

- Faculty Notes (Microsoft Word and Adobe Acrobat formats) - Includes notes that correspond to the slide presentation, a case study with discussion points, and test questions with answers
- Slide Presentation (Microsoft PowerPoint and Adobe Acrobat formats)
- Student Handouts
  - Case Study (Microsoft Word format)
  - Test Questions (Microsoft Word format)
  - Slides Handout (Adobe Acrobat format)
  - Resources (Microsoft Word format)

Suggested Time Allowance - The approximate time needed to present this module is 60-90 minutes.

These materials were developed by the Program and Training Branch, Division of STD Prevention, CDC. They are based on the curriculum developed by the National Network of STD/HIV Prevention Training Centers (NNPTC) which includes recommendations from the 2010 CDC STD Treatment Guidelines

Information on the NNPTC can be accessed at: www.nnptc.org

The 2010 CDC STD Treatment Guidelines can be accessed or ordered online at: www.cdc.gov/std/treatment/

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Division of STD Prevention
Program and Training Branch
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CHLAMYDIA
Chlamydia trachomatis

[Slide 1]

Chlamydia trachomatis

[Slide 2]

Learning Objectives
Upon completion of this content, the learner will be able to
- Describe the epidemiology of chlamydial infection in the United States;
- Describe the pathogenesis of C. trachomatis;
- Discuss the clinical manifestations of chlamydial infection;
- Identify common methods used in the diagnosis of chlamydial infection;
- List CDC-recommended treatment regimens for chlamydial infection;
- Summarize appropriate prevention counseling messages for patients with chlamydia; and
- Describe public health measures for the prevention of chlamydial infection.

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Lessons
I. Epidemiology: Disease in the U.S.
II. Pathogenesis
III. Clinical manifestations
IV. Diagnosis
V. Patient management
VI. Prevention

[Slide 4]

Lesson I: Epidemiology: Disease in the U.S.

[Slide 5]

Incidence and Cost
- Most commonly reported notifiable STI in the U.S.
- Estimated 2.9 million new infections in the U.S. annually (includes estimates of unreported infections)
  - STIs with higher annual estimated incidence
    - Human Papillomavirus (HPV) – 14.1 million
  - STDs with lower annual estimated incidence
    - Trichomoniasis – 1.1 million
    - Gonorrhea – 820,000
    - Herpes Simplex Virus (HSV) – 776,000Syphilis – 55,400
- The direct and indirect annual costs of chlamydial infection, including costs of treating complications, total approximately $2.4 billion.
National Chlamydia Surveillance Systems

- Case Reporting
- National Prevalence Survey
- Prevalence Monitoring (positivity from tests conducted through a screening program in sentinel sites)

Chlamydia—Rates of Reported Cases by State, United States and Outlying Areas, 2013

Graph - Case Reporting

- Chlamydia is reportable in all 50 states.
- In 2013, over 1.4 million cases were reported to CDC.
- In 2013, the total rate of chlamydia for the United States and outlying areas (Guam, Puerto Rico and Virgin Islands) was 443.5 per 100,000 population.
- During 1993–2011, the rate of reported chlamydial infection increased from 178.0 to 453.4 cases per 100,000 population. During 2011–2012, the national rate of reported cases remained stable (453.4 to 453.3 cases per 100,000). During 2012–2013, the rate decreased 1.5% to 446.6 cases per 100,000. This is the first time since national reporting began that the rate of reported cases of chlamydia has decreased.
- Increasing reported case rates may reflect increasing screening coverage, expanded use of more sensitive diagnostic tests, and more complete national reporting. Likewise, decreases in chlamydia case rates may suggest decreases in incidence of infection or screening coverage.
The female and male rate differential is partly attributable to screening practices, as routine screening is recommended for sexually-active young women. With the availability of new (urine-based) screening methods, it is likely that reported incidence in males will increase. The lower rates among men also suggest that many of the sex partners of women with chlamydia are not receiving a diagnosis of chlamydia or being reported as having chlamydia.

Rates of reported cases of chlamydia are highest among adolescents and young adults aged 15–24 years.
Surveillance data show higher rates of reported STDs among some racial or ethnic minority groups when compared with rates among whites. Race and ethnicity in the United States are population characteristics that are correlated with other fundamental determinants of health status such as high rates of poverty, income inequality, unemployment and low educational attainment. People who struggle financially are often experiencing life circumstances that potentially increase their risk for STDs.

In 2013, the rate of chlamydia among African Americans was 6.4 times the rate among whites (1,147.2 and 180.3 cases per 100,000 population, respectively), with approximately 31 percent of all chlamydia cases reported among African Americans. Additionally, the rates among American Indians/Alaska Natives (697.9 per 100,000) and Hispanics (377 per 100,000), were 3.9 times and 2.1 times the rate among whites, respectively.

Graph - National Prevalence Survey

Chlamydia – NHANES Prevalence: gender and race/ethnicity
- Based on National Health and Nutrition Examination Surveys, chlamydia prevalence among 14–39 year olds is estimated to be 1.5%.
- Prevalence is highest among non-Hispanic blacks as well as among women and adolescents and young adults.

Screening Results: Women in Sentinel Clinics, 2009
- Test positivity may serve as a proxy for prevalence
- In 2009, positivity among women tested in selected clinics
  - Family planning: 3.5%–15.5%
  - Youth detention facilities: 2%–36%
  - National job training recruits: 4%–19%

Risk Factors
- Adolescence (especially females)
  - Adolescents and young adults are at increased risk for chlamydial infection for a combination of biological, behavioral, and cultural reasons.
  - The presence of columnar epithelial cells on the ectocervix is called ectopy which may increase susceptibility to chlamydial infection. Ectopy is more common among adolescents.
  - Adolescents may have barriers to accessing preventive health care services, particularly for STDs.
- New or multiple sex partners
- History of past STI
• Presence of another STI
• Oral contraceptive user
• Lack of barrier contraception

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Transmission
• Transmission is sexual (genital) or vertical (perinatal).
  o *C. trachomatis* is highly transmissible (chlamydial infection rates in partners are > 50%).
  o Exact transmission rates unknown; transmission is thought to be more efficient from men to women.
  o At least 60%–70% of infants exposed to *C. trachomatis* during passage through the birth canal acquire infection. Conjunctivitis, the most frequent clinical manifestation, occurs in 15%–37% of exposed infants.
• Incubation period preceding symptomatic infection is thought to be 7–21 days.
• Significant asymptomatic reservoir exists in the population.
• Reinfection is common.

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Lesson II: Pathogenesis

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Microbiology
• *C. trachomatis* is an obligate intracellular bacterium with a Gram-negative-like cell wall.
• *C. trachomatis* infects columnar epithelial cells of cervix or urethra—may become chronic.
• *C. trachomatis* survives by replication that results in the death of the cell. (Alternative modes of replication and persistence of organisms are important research topics.)
• Chlamydia life cycle is approximately 48–72 hours.
• Chlamydia takes two forms in the cycle: elementary body (EB) and reticulate body (RB).
The elementary body (EB) is a small, infectious particle found in secretions. The EB attaches to and enters a cell, such as an endocervical or urethral cell, to replicate. This process induces a strong immune response that can result in damage and scarring to the infected site. Within 8 hours, the EB transforms into a reticulate body (RB), which begins to multiply within an isolated area called an inclusion. Within 24 hours, some RBs change back to EBs. Eventually the cell wall bursts and the EBs are released to adjacent cells or transmitted to infect another partner.

Chlamydiaceae Family (species that cause disease in humans)

Table

Chlamydiaceae family taxonomy

Three species that infect humans:

- *C. trachomatis*-causes trachoma in all ages, genital infections, lymphogranuloma venerum (LGV), and conjunctivitis in adults, and conjunctivitis and pneumonia in infants;
- *C. pneumoniae*-causes pharyngitis, bronchitis, and pneumonia; and
- *C. psittaci* (Parrot fever)-causes pneumonia.
- *C. trachomatis* causes urogenital infection in males and females, conjunctivitis in adults and neonates, and pneumonia in infants.
- Distinct strains of *C. trachomatis* cause the eye disease, trachoma, and lymphogranuloma venerum (LGV).

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**C. trachomatis Infection in Men**
- Majority of infections (>50%) asymptomatic
- Urethritis (inflammation of the urethra)
  - Most common site of infection in males
  - One cause of nongonococcal urethritis (NGU). Incubation period unknown (probably 7–21 days in symptomatic infection)
  - Signs/symptoms if present: dysuria, urethral discharge (clear or mucoid)
    - Distinguishing gonococcal urethritis (GU) from NGU on clinical exam is not reliable nor is it possible to distinguish *C. trachomatis*-positive NGU from *C. trachomatis*-negative NGU on clinical exam.
    - The discharge from urethritis caused by *C. trachomatis* tends to be a muco-purulent, mucoid or clear, rather than frankly purulent as in gonorrhea.
    - Many newly infected men remain asymptomatic or minimally symptomatic, which results in an accumulation of unrecognized infections in the male population.

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**Nongonococcal Urethritis: Mucoid Discharge**

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**C. trachomatis Complications in Men**
Complications are uncommon in men. If complications do occur, they may include the following.
- Epididymitis (inflammation of the epididymis)
o Infrequent, but most common local complication of *C. trachomatis* infection in young males.
- Bacterial etiology varies by sexual behavior and age.
- Up to 70% of sexually-transmitted cases are due to *C. trachomatis*; other cases are due to *N. gonorrhoeae*; some cases have both pathogens. The etiology varies by sexual behavior and age.
  - Sexually-transmitted cases in young heterosexuals are usually caused by chlamydia or gonorrhea.
  - Sexually-transmitted cases in men who have sex with men can also be caused by enteric organisms, in addition to chlamydia, and gonorrhea.
  - Can also be nonsexually transmitted, such as epididymitis caused by *E. coli* or pseudomonas in older men.
- Symptoms/signs: fever, epididymal/unilateral scrotal pain, swelling, tenderness, evidence of NGU on Gram stain, epididymal tenderness/mass on exam
- Reactive Arthritis (rare)
  - Post inflammatory immune response following infection with *C. trachomatis*
  - Predominantly affects males
  - Characteristic manifestations of the syndrome include conjunctivitis, urethritis, oligoarthritis, and skin lesions (keratoderma blenorrhagica and circinate balanitis) occurring 3–6 weeks after genital chlamydial infection.
  - Chlamydial antigens and DNA can be present within joints.
  - Symptoms usually respond to non-steroidal anti-inflammatory agents. Use of long-term antimicrobial treatment under study.
  - Most cases will spontaneously resolve within 2–6 months, but can last more than one year.

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**Swollen or Tender Testicles (epididymitis)**

*Image*

Swollen or Tender Testicles (epididymitis)

Source: Seattle STD/HIV Prevention Training Center at the University of Washington
C. trachomatis Infections in Women

- The most common infections in women.
- Of women cultured for *C. trachomatis* at both the cervix and urethra, approximately 50% of positive women yield chlamydia from both sites, and 25% from either site alone.
- Cervicitis (inflammation of the cervix)
  - Most cervical infections are asymptomatic.
  - When present, signs and symptoms may be nonspecific, such as spotting, or may include mucopurulent endocervical discharge or friability (easily induced bleeding) within the endocervix. Other causes of mucopurulent cervicitis include *N. gonorrhoeae* and possibly *M. genitalium*. In the majority of cases of cervicitis, the cause is unknown. The majority of women with *C. trachomatis* infections cannot be distinguished from uninfected women by clinical examination.
- Urethritis (inflammation of the urethra)
  - Usually asymptomatic
  - May cause the “dysuria-pyuria” syndrome, or the “acute urethral syndrome”, mimicking acute cystitis. Symptoms include dysuria and frequency, often seen in young women with a recent new sex partner.
  - On urinalysis, pyuria present, but few bacteria.

**DISCUSSION QUESTION:** Describe this cervix.

This is a slide of a normal healthy cervix. The cervical os is small and oval or slit-like and the cervix is covered by squamous pink epithelium.
DISCUSSION QUESTION: Describe this cervix. This slide shows a mucopurulent discharge coming from the cervical os.
C. trachomatis Complications in Women

- Pelvic Inflammatory Disease (PID) – a subclinical to an acute clinical syndrome associated with ascending spread of microorganisms from the vagina or cervix to the endometrium, fallopian tubes, ovaries, and contiguous structures.
  - PID is defined as any combination of the following:
    - Endometritis (inflammation of the endometrium)
    - Salpingitis (inflammation of the fallopian tubes)
    - Tubo-ovarian abscess, or
    - Pelvic peritonitis
  - Signs and symptoms of PID, when present:
    - Lower abdominal pain
    - Cervical motion tenderness
    - Uterine or adnexal tenderness on pelvic exam
  - A substantial proportion of chlamydia-associated PID is clinically silent, but still results in tubal scarring which may lead to infertility and ectopic pregnancy.
  - It is estimated that as many as 10%–15% of women with untreated C. trachomatis infection will develop PID. Of those with PID, 10%–15% will become infertile, 18% will experience chronic pelvic pain, and 9% will have ectopic pregnancy.

- Perihepatitis (Fitz-Hugh-Curtis syndrome)
  - Inflammation of the liver capsule, initially attributed to gonococcal infection, but now more often (up to 70%) associated with chlamydial disease.
  - Characterized by right upper quadrant pain, nausea, vomiting, and fever
  - May be accompanied by signs of PID on a physical exam

- Reactive arthritis (see male complications)
The Scanning Electron Micrograph (SEM) shows a normal human fallopian tube epithelial tissue with healthy mucosal folds. The normal ciliated cell contains 250-300 cilia per individual cell (x1,500).

The Scanning Electron Micrograph (SEM) shows ciliated and secretory epithelial cells that appear to be breaking away from the normally intact mucosal surface. Large cracks appear on the mucosal surface. Note the sparse distribution of ciliated cell types in these diseased tissues (x 2,600). The lack of the ciliated cell type can impair fertilized...
ovum transport.

**DISCUSSION QUESTION:** What could happen as a result of impaired ovum transport?

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**Acute Salpingitis**

*Image*

Inflammation of the fallopian tubes

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**Other Less Common C. trachomatis Syndromes Seen in Men or Women**

- Conjunctivitis (inflammation of the conjunctiva)
  - In adults, it usually occurs as a result of autoinoculation from infected genitalia.
  - Signs/symptoms: unilateral eye discomfort, hyperemia, with nonpurulent secretions
- Proctitis (inflammation of the anus and rectum)
  - Signs/symptoms - rectal pain, discharge, fever, tenesmus, abnormal anoscopy (mucopurulent discharge, pain, spontaneous or induced bleeding)
  - Infection is often seen in persons practicing receptive anal sex.
  - Rectal colonization of chlamydia in women can also be due to the spread of secretions from the cervix. This is seen in approximately 25%–30% of patients, but generally doesn't lead to symptomatic disease.
- Reactive arthritis (see male complications)
- Lymphogranuloma venereum (LGV)
  - Caused by LGV serovars (L1, L2, L3) - rarely seen in the U.S., although sporadic cases and outbreaks reported among MSM in Europe and U.S.
  - Signs/symptoms - Multiple, enlarged, matted, tender inguinal lymph nodes that may be suppurative and are usually bilateral. Generalized signs and symptoms such as fever, chills, meningismus, or myalgias may also be present. A self-
limited genital lesion may occur at the site of inoculation.

- Rectal infection can lead to severe proctitis or proctocolitis (associated with rectal pain, mucoid or hemorrhagic discharge, fever, tenesmus. Genital and lymph node specimens are tested for *C. trachomatis* by culture, direct immunofluorescence, or nucleic acid detection. Additional procedures are required to differentiate LGV from non-LGV and trachomatis. Chlamydia serology section can support the diagnosis in the appropriate clinical context.

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**LGV Lymphadenopathy**

**Image**

![Image of LGV Lymphadenopathy](source: CDC Division of STD Prevention Clinical Slides)

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**C. trachomatis Infections in Infants**

Most common clinical manifestations

- Inclusion conjunctivitis (ophthalmia neonatorum)
  - Occurrence: 5–14 days after delivery
  - Signs/symptoms - range from mild, with a scant mucoid discharge, to severe with copious purulent discharge, chemosis, and pseudomembrane formation, erythema, friability, or edema.
  - Neonatal ocular prophylaxis with silver nitrate or antibiotic ointments, while effective for prevention of *N. gonorrhoeae*-induced conjunctivitis, is not effective in preventing conjunctivitis caused by *C. trachomatis*.

- Pneumonia
  - Occurrence - 4–12 weeks after delivery
  - Signs/symptoms - cough and congestion, tachypnea, rales apparent with auscultation of the lungs, usually afebrile.

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**C. trachomatis Infections in Children**

Preadolescent males and females
- Most vaginal and rectal infections in boys and girls are asymptomatic.
- Vertical transmission - Vaginal and rectal infection in young children can occur as a result of perinatal transmission. Genital or rectal infection can persist for as long as 2–3 years and be the result of perinatally-acquired infection.
- Sexual abuse
  - If sexual abuse is suspected, the STD evaluation should be performed by, or in consultation with, an expert in the assessment of child sexual abuse.
  - If STD testing is indicated, because of the legal and psychosocial consequences of a false-positive diagnosis, only tests with high specificities should be used.
  - If sexual abuse is suspected, specimens for \( C.\ trachomatis \) cultures should be collected from the anus in both boys and girls and from the vagina in girls.
  - Nucleic Acid Amplification Tests (NAATs) can be used for detection of \( C.\ trachomatis \) in vaginal specimens or urine from girls. No data are available regarding the use of NAATs in boys, or for extragenital specimens. Cultures remain the preferred method for extragenital sites.

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Lesson IV: Diagnosis

The selection of a laboratory test to detect the presence of \( C.\ trachomatis \) is a critical component of disease management and prevention. The diagnostic technology has changed significantly over the past 15 years and represents a substantial improvement in sensitivity.

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Chlamydia Diagnostics
- Preferred
  - Nucleic acid amplification tests (NAATs)
- Acceptable in limited circumstances
  - Culture
- Not recommended
  - Non-amplification tests
  - Serology

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NAATs
- Nucleic acid amplification tests (NAATs) amplify and detect organism-specific genomic or plasmid DNA or rRNA
- A number of NAATs are commercially available. They include Abbott LCX, Artus/Qiagen RealArt PCR, Becton Dickinson \( BD\) \( \text{Teco}\); Gen-Probe AmpCT, APTIMA®; Roche Amplicor®
- Some NAATs can detect \( C.\ trachomatis \) and \( N.\ gonorrhea \) in the same specimen
- NAATs increase sensitivity to 80%–90% for cervical and urethral swabs
- Specificity >99%
- NAATs are cleared for urine in men and women, urethral swabs in men,
endocervical swabs in women, and some tests are cleared for vaginal swabs.

- All NAATs can be used on first catch (10–15 cc) of urine specimens from men and women (recommended >2 hours after last void).
- Self-collected vaginal swabs perform at least as well as other approved specimens using NAATs (i.e., Gen-Probe Aptima).
- Although the use for pharyngeal and rectal specimens is not FDA-cleared, some laboratories have completed the requirements to perform NAATs on these specimens. NAATs have shown improved sensitivity and specificity when compared with culture for the detection of *C. trachomatis* at rectal sites and at oropharyngeal sites among men.

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**Culture**

- Historically the “gold standard”
- Variable sensitivity (50%–80%)
- High specificity
- Use in legal investigations
- Approved for use in all anatomical sites
- Not suitable for widespread screening (cost and complexity)

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**Non-Amplification Tests: Not Recommended**

- Rely on detection of bacterial products (proteins, nucleic acid) in patient samples. Less expensive than culture or NAATs. A disadvantage is that they have sensitivities that range from 50% to 75%.
- Non-culture, non-amplified tests
  - Direct Fluorescent Antibody (DFA), e.g., *MicroTrak®*
  - Enzyme Immunoassay (EIA), e.g., *Chlamydiazyme®*
  - Nucleic acid hybridization (NA probe), e.g., Gen-Probe *Pace 2®*

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**Serology**

- Rarely used for uncomplicated genital infections
- For the diagnosis of LGV, complement-fixation test titers of 1:64 or greater (can support the diagnosis of LGV in the appropriate clinical context)
- High background prevalence and infrequent rises and falls in IgG and IgM
- May be useful in selected tissue invasive infections (perihepatitis, LGV, PID, infant pneumonitis). Problems with specificity exist.
**DISCUSSION:** Review of terminology – sensitivity and specificity

**Sensitivity**
- Likelihood a test will be positive when disease is present
- If 100 infected people are tested and test results are positive for 85, the sensitivity is 85% (85/100).

**Specificity**
- Likelihood a test will be negative when disease is not present
- If 100 noninfected people are tested, and test results are negative for 99, the specificity is 99% (99/100).

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**Lesson V: Patient Management**

**Treatment of Uncomplicated Genital Chlamydial Infections**
- CDC-recommended regimens
  - Azithromycin, 1 g orally in a single dose, or
  - Doxycycline 100 mg orally twice daily for 7 days
- Alternative regimens
  - Erythromycin base 500 mg orally 4 times a day for 7 days, or
  - Erythromycin ethylsuccinate 800 mg orally 4 times a day for 7 days, or
  - Ofloxacin 300 mg orally twice a day for 7 days, or
  - Levofloxacin 500 mg orally once a day for 7 days

**Treatment of Chlamydial Infection in Pregnant Women**
- CDC-recommended regimens
  - Azithromycin 1 g orally in a single dose, or
  - Amoxicillin 500 mg orally 3 times a day for 7 days
- Alternative regimens
  - Erythromycin base 500 mg orally 4 times a day for 7 days, or
  - Erythromycin base 250 mg orally 4 times a day for 14 days, or
  - Erythromycin ethylsuccinate 800 mg orally 4 times a day for 7 days, or
  - Erythromycin ethylsuccinate 400 mg orally 4 times a days for 14 days, or
- Because of the longer history and experience with these drugs, Amoxicillin and Erythromycin are listed as compatible with all stages of pregnancy and breastfeeding. Azithromycin is a newer drug, so there is limited human data, but animal data suggest that it is low risk in all stages of pregnancy and breastfeeding. Erythromycin estolate contraindicated but is no longer available in the United States. Doxycycline is contraindicated in the second and third trimesters of pregnancy. Human data suggest that ofloxacin and levofloxacin are low risk during pregnancy.

**Treatment of Neonatal Conjunctivitis and/or Pneumonia**
CDC-recommended regimen – Erythromycin base or ethylsuccinate 50 mg/kg/day orally
divided into 4 doses daily for 14 days
- An association between oral erythromycin and infantile hypertrophic pyloric stenosis (IHPS) has been reported in infants less than 6 weeks of age who were treated with the drug. Infants treated with erythromycin should be followed for signs and symptoms of IHPS. Data on use of other macrolides (azithromycin and clarithromycin) for the treatment of neonatal chlamydia infection are limited. The results of one small study suggest that a short course of azithromycin, 20 mg/kg/day orally, 1 dose daily for 3 days may be effective.
- The effectiveness of erythromycin in treating pneumonia is approximately 80%; a second course of therapy may be required.
- Prophylactic antibiotic treatment for infants born to mothers who have an untreated chlamydial infection is not indicated. Infants should be monitored to ensure appropriate treatment if infection develops.

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**Treatment of Chlamydial Infection in Children**

CDC-recommended regimens
- Children who weigh <45 kg
  - Erythromycin base or ethylsuccinate 50 mg/kg/day orally divided into 4 doses daily for 14 days
- Children who weigh ≥ 45 kg, but are < 8 years of age
  - Azithromycin 1 g orally in a single dose
- Children ≥ 8 years of age
  - Azithromycin 1 g orally in a single dose, or
  - Doxycycline 100 mg orally twice a day for 7 days

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**Treatment of Lymphogranuloma Venereum (LGV)**
- CDC-recommended regimen – Doxycycline 100 mg orally twice a day for 21 days
- Alternative regimen – Erythromycin base 500 mg orally 4 times a day for 21 days
- Some experts believe azithromycin 1 g orally once weekly for 3 weeks is likely to be effective, although clinical data are lacking. The activity of azithromycin against *C. trachomatis* suggests that it may be effective in multiple doses.

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**Repeat Testing after Treatment**
- There has been no *clinically significant* emergence of drug resistance among *C. trachomatis* strains.
- Pregnant women
  - Test of cure by NAAT 3 weeks after completion of therapy
  - Repeat testing for reinfection 3 months after completion of therapy
- Nonpregnant women and men
  - Repeat testing 3 months after treatment is recommended to detect reinfection with *C. trachomatis*
  - If not possible, then repeat testing should be performed at next presentation for care within 12 months
• Test of cure (3 weeks after therapy) is not recommended, but can be considered when
  o compliance is in question,
  o symptoms persist,
  o reinfection is suspected, or
  o erythromycin is used.

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Lesson VI: Prevention

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Why Screen for Chlamydia?
Screening (testing of asymptomatic individuals)
• Most infections are asymptomatic.
Screening for chlamydia has been found to reduce the incidence of pelvic inflammatory disease in women, complications in the individual, and may decrease the burden of disease in the community. Screening may reduce the incidence of PID by more than 50%.

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Screening Recommendations: Nonpregnant Women
• Universal screening of sexually-active women < age 25 should be done annually. Supported by the CDC, the U.S. Preventive Services Task Force (USPSTF), the American Academy of Pediatrics, the American College of Obstetricians and Gynecologists, and the American Academy of Family Physicians.
• Women ≥25 years old should be screened if risk factors are present.
• Repeat testing of all women approximately 3 months after treatment of C. trachomatis infection.
• If not possible, then repeat testing should be performed at next presentation for care within 12 months.

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Screening Recommendations: Pregnant Women
• Screen all pregnant women at the first prenatal visit.
• Screen women <25 years and those at increased risk again in the third trimester.

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Screening Recommendations: Men
• Screening of sexually-active young men should be considered in clinical settings with a high prevalence of chlamydia (e.g., adolescent clinics, correctional facilities, and STD clinics) and when resources permit.
• Repeat testing is recommended for all men approximately 3 months after treatment of C. trachomatis infection.
• If not possible, then repeat testing should be performed at next presentation for care within 12 months.
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**Partner Management**

- Sex partners should be evaluated, tested, and treated if they had sexual contact with the patient during the 60 days preceding the patient’s onset of symptoms or diagnosis of chlamydia.
- The most recent sex partner should be evaluated and treated, even if the time of the last sexual contact was >60 days before symptom onset or diagnosis.
- If concerns exist that sex partners will not seek evaluation and treatment, or if other management strategies are impractical or unsuccessful, then delivery of antibiotic therapy by heterosexual male or female patients to their partners is an option in some jurisdictions. This is known as “patient-delivered partner therapy” and is a form of expedited partner therapy or “EPT”. Patient-delivered partner therapy is not routinely recommended for MSM because of high risk for coexisting infections.
- Information on the legal status of EPT in your jurisdiction can be obtained from your state or local health department, or on the CDC Website (www.cdc.gov/std/ept).

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**Reporting**

Laws and regulations in all states require that persons diagnosed with chlamydia are reported to public health authorities by clinicians, labs, or both.

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**Prevention Counseling**

- Nature of the infection
  - Asymptomatic infection is common in both men and women.
  - In women, there is an increased risk of upper tract damage with reinfection.
- Transmission issues
  - Effective treatment of chlamydia may reduce HIV transmission and acquisition.
  - Patients should be instructed to abstain from sexual intercourse until they and their sex partners have completed treatment for 7 days after a single dose of azithromycin, or until completion of a 7-day regimen. Timely treatment of sex partners is essential for decreasing the risk for reinfection of the index patient.
- Risk reduction
  - The clinician should
    - Assess the patient’s behavior-change potential.
    - Discuss prevention strategies (abstinence, mutual monogamy with an uninfected partner, condoms, limit number of sex partners, etc.). Latex condoms, when used consistently and correctly, can reduce the risk of transmission of chlamydia.
    - Develop individualized risk-reduction plans.
Case Study

History
Suzy Jones is a 17-year-old college student who presents to the Student Health Center seeking advice about contraception.

- White female
- College student
- Seeking advice about contraception
- Shy talking about her sexual practices
- Has never had a pelvic exam
- Has had 2 sex partners in past 6 months
- Does not use condoms or any other contraceptives
- Her periods have been regular, but she has recently noted some spotting between periods. Last menstrual period was 4 weeks ago.
- Denies vaginal discharge, dyspareunia, genital lesions, or sores

Physical Exam

- Vital signs: blood pressure 118/68, pulse 74, respiration 18, temperature 37.1°C
- Breast, thyroid, and abdominal exam within normal limits
- The genital exam reveals normal vulva, and vagina.
- The cervix appears inflamed, bleeds easily, with a purulent discharge coming from the cervical os.
- The bimanual exam is normal without cervical motion pain, uterine or adnexal tenderness.

Questions

1. Based on Suzy’s history and physical exam, what is the initial clinical diagnosis?

Cervicitis:
The clinical diagnosis of cervicitis is made when a purulent or mucopurulent exudate is seen coming from the endocervical canal, or on a swab placed in the endocervix (swab test). Some experts also make the diagnosis of cervicitis based on cervical friability, or easily induced bleeding.

2. What is the most likely microbiologic diagnosis?

Chlamydia and/or gonorrhea:
Based on the patient’s age and the overall epidemiology of STDs, chlamydia and/or gonorrhea are the most likely diagnoses.

HSV and Trichomonas vaginalis tend to cause an ectocervicitis instead of a purulent endocervical exudate. Also, trichomoniasis is usually accompanied by a copious
vaginal discharge and vaginal irritation. Herpetic cervicitis is often accompanied by ulcerations on other parts of the genital tract. In many cases of cervicitis, no etiologic agent is found.

3. Which laboratory tests should be ordered or performed?

Appropriate laboratory tests include the following:

- A pregnancy test – Irregular bleeding can also be caused by pregnancy.
- *Chlamydia trachomatis* – NAAT is the most sensitive test for detection.
- *Neisseria gonorrhoeae* – NAAT is the most sensitive test for detection. Saline wet mount, pH, and KOH preparation of vaginal secretions – A microscopic examination of vaginal secretions can help identify other etiologies of cervicitis, such as trichomoniasis, candidiasis or bacterial vaginosis.
- Counseling and testing for HIV – Age and history of sexual activity are an indication for offering HIV testing.
- Depending upon local epidemiology, additional testing for syphilis (RPR or VDRL) or trichomoniasis might be indicated.

4. What is the appropriate treatment at the initial visit?

The patient should be treated at the initial visit with **Azithromycin 1 g orally in a single dose** and **Ceftriaxone 250 mg intramuscularly in a single dose**. Because of the presence of cervicitis and the risk of chlamydia and gonorrhea (age < 25 years, partners, unprotected sex), CDC recommends that the patient should be treated empirically for gonorrhea and chlamydia at the initial visit. Doxycycline 100 mg orally twice a day for 7 days is an alternative recommended therapy for chlamydia. Azithromycin has the advantage of its single dose and directly observed therapy when patient adherence is in question.

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**Laboratory Results**

The test results are back from the laboratory.

Laboratory test results for Suzy Jones:

- NAAT for *Chlamydia trachomatis* – positive
- NAAT for *Neisseria gonorrhoeae* – negative
- Wet mount – pH 4.2, no clue cells or trichomonads, but numerous white blood cells (WBCs)
- KOH preparation – negative for “whiff test”
- HIV antibody test – negative
- Pregnancy test – negative

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**Questions**

5. What is the final diagnosis?
Chlamydial cervicitis
The positive NAAT confirms the diagnosis.

6. What are the appropriate prevention and counseling messages for Suzy?

Appropriate prevention and counseling messages include the following:
- Suzy should refer her sex partners for evaluation, testing, and treatment.
- Chlamydia is often asymptomatic in men and women. Sequelae that can result from *C. trachomatis* infection in women include pelvic inflammatory disease (PID), ectopic pregnancy, and infertility.
- Effective treatment of chlamydia may reduce HIV acquisition and transmission.
- Suzy should abstain from intercourse for 7 days after she and her sex partners have completed treatment with a single dose of azithromycin, or until completion of an alternative 7-day regimen.
- Discuss individual risk-reduction and prevention strategies, including abstinence, monogamy with an uninfected partner, and condoms.
- Condoms, when used consistently and correctly, can reduce the risk of chlamydia transmission.
- If a hormonal contraceptive method (i.e., birth control pills, Depo-Provera) is prescribed, inform the patient that these methods of birth control offer no protection from STDs and HIV infection.
- Return to the clinic for re-test in 3 months, due to the high prevalence of repeat infection.

7. Who is responsible for reporting this case to the local health department?

Depending on local requirements, the health care provider, the laboratory, or both are responsible for reporting the case. Chlamydia is a reportable STD in all 50 states. In most areas, both the provider and the laboratory are required to report chlamydia cases to the local health department. Check with your local health department for details on reporting requirements in your area.

The CDC Division of STD Prevention website contains a link to state and some local health departments: [http://www.cdc.gov/nchstp/dstd/Public_Health_dept.htm](http://www.cdc.gov/nchstp/dstd/Public_Health_dept.htm)

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**Partner Management**

Suzy has had 3 sex partners in the past year:
- John – Last sexual exposure 5 weeks ago
- Tom – Last sexual exposure 7 months ago
- Michael – Last sexual exposure 2 weeks ago

8. Which sex partners should be evaluated, tested, and treated?
John and Michael should be evaluated, tested, and treated. Treatment of sex partners is critical to avoid reinfection. Sex partners within the last 60 days should be evaluated, tested, and treated. If the patient with chlamydia has not had sex within 60 days, then treatment of the most recent sex partner is indicated. Chlamydial infection in men is most often asymptomatic.

Partner delivered therapy is an option in some areas. Check with your local health department to see if it is appropriate in your area.

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Follow-Up
Suzy returned for a follow-up visit at three months.

Three-month follow-up:
- A repeat chlamydia test was positive.
- Suzy stated that her partner, Michael, went to get tested, but the test result was negative so he was not treated.

9. What is the appropriate treatment at the 3-month follow-up visit?

Azithromycin 1 g orally in a single dose. The patient should be retreated for chlamydia with Azithromycin 1 g orally in a single dose. She should be counseled to ensure that she does not resume sexual activity until all her partners are evaluated and treated. If legally permitted, EPT should be offered for all of her partners. She should also return for chlamydia screening in 3 months.
TEST QUESTIONS

1. What is the most commonly reported notifiable STI in the United States?
   a) Human Papillomavirus (HPV)
   b) **Chlamydia**
   c) Herpes Simplex Virus (HSV)
   d) Gonorrhea

2. Which of the following STIs has a higher annual estimated incidence than chlamydia?
   a) Gonorrhea
   b) **HPV**
   c) HSV
   d) Syphilis

3. The reported rates of chlamydia are higher in women than in men. This could be due to which of the following:
   a) Women are more symptomatic and access care more frequently.
   b) Men are less likely to exchange sex for drugs.
   c) **Women are screened for chlamydia more often than men.**
   d) The bacteria are increasing in drug resistance; hence, the disease is more difficult to treat.

4. The pathogenesis of chlamydia includes which of the following?
   a) The reticulate body becomes an elementary body.
   b) The reticulate body enters vaginal cells.
   c) **The elementary body enters the endocervical cells.**
   d) There is no permanent damage to the cells which are invaded.

5. All of the following statements are true of *C. trachomatis* except:
   a) *C. trachomatis* is an obligatory intracellular organism.
   b) *C. trachomatis* organisms survive by replication that result in death of the cell they enter.
   c) **The life cycle of *C. trachomatis* is 6 hours.**
   d) The elementary body is the infectious particle of *C. trachomatis*.

6. Chlamydia causes mucosal infection of which type of cell?
   a) **Columnar**
   b) Squamous
   c) Glandular
   d) Keratinized

7. Which of the following best describes the clinical signs/symptoms of chlamydial urethral infection in men?
   a) Yellow discharge from penis
   b) Dysuria
c) Scrotal pain  
d) **Most men are asymptomatic.**

8. If symptomatic in men, the most common symptom of *C. trachomatis* infection is:  
a) Scrotal pain  
b) Penile pain  
c) **Urethral discharge**  
d) Reactive arthritis

9. Which of the following is true regarding chlamydial infection in men?  
a) **Epididymitis is a complication of untreated *C. trachomatis* infection.**  
b) Epididymitis is always the result of a sexually transmitted infection.  
c) Men almost always experience symptoms.  
d) Chlamydial urethritis (or NGU) can be reliably distinguished clinically from gonococcal urethritis by its association with a clear urethral discharge (in contrast to gonorrhea’s thicker yellow discharge).

10. Which of the following is **not** one of the characteristic symptoms of reactive arthritis?  
a) Prostatitis  
b) Urethritis  
c) Conjunctivitis  
d) Oligoarthritis

11. Which of the following best describes the clinical signs/symptoms of chlamydial infection in women?  
a) Most women complain of a discharge.  
b) Most women complain of urinary symptoms.  
c) Clinical signs/symptoms depend on the duration of infection.  
d) **Most women are asymptomatic.**

12. Complications of untreated chlamydial infection in women include all of the following except:  
a) Perihepatitis  
b) Salpingitis  
c) Endometritis  
d) **Gastritis**

13. Which of the following statements is true about *C. trachomatis* in women?  
a) The majority of women are symptomatic.  
b) The majority of women with infection can be identified by clinical examination.  
c) The most frequent sequelae of untreated disease is having a life-threatening ectopic pregnancy.  
d) **Chlamydia-associated PID is sometimes sub-acute or silent.**

14. Which of the following is a method to diagnose chlamydial infection?  
a) Nucleic acid (DNA, RNA) amplification technique
b) Cell culture techniques, using live cells  
c) Antigen detection methods  
d) **All of the above**

15. The laboratory test for *C. trachomatis* with the highest sensitivity is:  
a) **NAAT (nucleic acid amplification test)**  
b) Culture  
c) DFA (MicroTrak)  
d) EIA (Chlamydiazyme)

16. The CDC-recommended treatment of choice for uncomplicated genital chlamydial infection is:  
a) Amoxicillin 500 mg orally 3 times a day for 7 days  
b) Tetracycline 250 mg orally 4 times a day for 7 days  
c) **Azithromycin 1 g orally in a single dose OR Doxycycline 100 mg orally twice a day for 7 days**  
d) Erythromycin 250 mg orally 4 times a day for 14 days

17. The CDC-recommended treatment of choice for uncomplicated genital chlamydial infection in pregnant women is:  
a) **Azithromycin 1 g orally in a single dose OR Amoxicillin 500 mg orally 3 times daily for 7 days**  
b) Tetracycline 250 mg orally 4 times a day for 7 days  
c) Erythromycin 250mg orally 4 times a day for 14 days  
d) Ofloxacin 300 mg orally twice a day for 7 days

18. Patients and their partners who undergo the recommended treatment should wait how long after starting the treatment before resuming intercourse?  
a) 3 days  
b) **7 days**  
c) 10 days  
d) 14 days

19. The risk of transmitting or acquiring chlamydial infection can be reduced by which of the following methods:  
a) Abstinence  
b) Reducing risky sexual behavior(s)  
c) Consistent and correct use of latex condoms  
d) **All of the above can help reduce the risk of chlamydial infection.**

20. Which of the following is true for sex partners of a patient diagnosed with chlamydia?  
a) Only the most recent sex partner needs to be referred for treatment.  
b) **All partners exposed in the last 60 days should be referred for treatment.**  
c) Only symptomatic partners need to be referred for treatment.  
d) No partners need to be referred since chlamydia is not efficiently transmitted.
21. Which of the following is NOT a CDC recommendation for chlamydia screening?
   a) Screen all sexually active women age 25 years and under annually.
   b) Women > 25 years should be screened if risk factors are present.
   c) **Screen all sexually active young men.**
   d) Repeat testing of infected women approximately 3 months after treatment.

22. In which state is chlamydia not reportable?
   a) **Chlamydia is reportable in all states.**
   b) Alabama
   c) Oregon
   d) Idaho

23. Who is responsible for reporting a case of chlamydia to the local health department?
   a) The laboratory
   b) The health care provider
   c) None of the above—chlamydia is not reportable in most states
   d) **Depending on the state: the laboratory, the health care provider, or both.**
RESOURCES

Publications


**Websites and Other Resources**

1. CDC, Division of STD Prevention: www.cdc.gov/std
3. 2010 CDC STD Treatment Guidelines (including downloadable version for iPad, iPod, and iPhone devices): www.cdc.gov/STD/treatment/
4. STD information and referrals to STD clinics
   CDC-INFO
   1-800-CDC-INFO (800-232-4636)
   TTY: 1-888-232-6348
   In English, en Español
5. CDC National Prevention Information Network (NPIN): www.cdcnpin.org