Chlamydia (Chlamydia Bacteria Infection) — Symptoms and Treatment

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Chlamydia is caused by gram-negative bacteria from the Chlamydiaceae family. The mainly sexually and perinatally transmitted pathogens cause disease in the eye, genital and pulmonary area. Untreated chlamydial infections may have serious consequences. Learn all about pathogenesis, symptoms, diagnosis, and treatment of infections with chlamydia in this article. As a result, we guarantee optimal preparation for clinical examinations and practical medical work.

Definition and Overview of Chlamydia

Gram-negative bacteria

The family of Chlamydiaceae contains 3 human pathogens:

- Trachomatis
- Psittaci
- Pneumoniae

Chlamydiae are immobile, gram-negative bacteria. The cell wall does not contain a peptidoglycan layer, but lipopolysaccharides. Common to all chlamydiae is their complex
reproduction cycle. Due to a defect in their own energy metabolism, *Chlamydiae* are dependent on the metabolism of the host.

*Chlamydiae* have the ability to establish long-term associations with host cells. When an infected host cell is starved for various nutrients such as amino acids (for example, tryptophan), iron, or vitamins, this has a negative consequence for *Chlamydia* because the organism is dependent on the host cell for those nutrients. Long-term cohort studies indicate that approx. 50% of those infected clear within a year, 80% within 2 years, and 90% within 3 years.

Starved *chlamydiae* enter a persistent growth state wherein they stop cell division and become morphologically aberrant by increasing in size. Persistent organisms remain viable, as they are capable of returning to a normal growth state once conditions in host cells improve.

<table>
<thead>
<tr>
<th></th>
<th><em>Chlamyphila trachomatis</em></th>
<th><em>Chlamyphila psittaci</em></th>
<th><em>Chlamyphila pneumoniae</em></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Host</strong></td>
<td>Human</td>
<td>Birds (especially parrots, pigeons, and budgies)</td>
<td>Human</td>
</tr>
<tr>
<td>Diseases</td>
<td>Ornithosis/Psittacosis</td>
<td>Respiratory infections</td>
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<tr>
<td><strong>Serotypes A-C: trachoma</strong> (a chronic recurrent disorder of the conjunctivae and cornea of the eye)</td>
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<tr>
<td>Serotypes D-K: sexually transmitted urogenital infections and infections of the conjunctiva, perinatal infections</td>
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<tr>
<td>Serotypes L1, L2, L3: Lymphogranuloma venereum</td>
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</table>

**Epidemiology of Chlamydia**

Globally, as of 2013, sexually transmitted chlamydia affected approx. 141 million people (3.1% of the population). It is more common in women (3.8%) than in men (2.5%). In 2013, it resulted in about 1,100 deaths, down from 1,500 in 1990.

In the United States, about 1.4 million cases were reported in 2014. The centers for disease control and prevention estimates that if unreported cases are included, there are about 2.8 million each year. Chlamydia affects approx. 2% of young people. Infections are most common among those aged 15-25 years. The infection is more common in U.S. women than in U.S. men. In 2013, infections resulted in about 1,100 deaths. Chlamydia infection is the most common bacterial sexually transmitted infection in the United Kingdom.

Chlamydia causes more than 250,000 cases of epididymitis and 250,000-500,000 cases of the pelvic inflammatory disease every year in the United States. Women infected with chlamydia are up to 5 times more likely to become infected with human immunodeficiency virus (HIV) if exposed.

**Epidemiology of Chlamydia trachomatis**

- 30%-50% of all sterility is caused by chlamydia.
- 90% of all sterility caused by tube closure is caused by infections with *Chlamydia trachomatis*.
- Every 4th woman infected with chlamydia is affected by subsequent sterility.

*Image:* This photomicrograph reveals McCoy cell monolayers with *Chlamydia trachomatis* inclusion bodies, magnified 200X. By Centers for Disease Control and Prevention/Dr. E. Arum, Dr. N. Jacobs, Licence: Free

*Chlamydia trachomatis* is 1 of the most common pathogens of sexually transmitted diseases worldwide. According to the World health organization (2001), 89 million new infections with genital chlamydia occur worldwide per year. Particularly
affected are persons with frequently changing sexual partners and children of infected mothers.

In pregnant women, 2%-3% are populated with C. trachomatis. Their infants are at a 50% risk of infection at birth.

The incidence of lymphogranuloma venereum has decreased worldwide, but the sexually transmitted infection is still endemic in Asia, Africa, South America, and parts of the Caribbean.

Trachoma occurs almost exclusively in tropical countries under poor hygienic conditions. After cataracts, trachoma is the second most common cause of blindness in the world.

**Age group:** Young adults (15–22 years)

**Epidemiology of Chlamyphila psittaci**

**Risk groups are:**
- Bird owners
- Animal keepers and vets
- Employees in pet shops, poultry farms, and slaughterhouses

Transmission takes place by direct contact or by inhalation of dust particles or feces. Human-to-human transmission has not yet been demonstrated.

**Epidemiology of Chlamyphila pneumoniae**

*C. Pneumoniae* is a very common worldwide cause of respiratory infections in humans. According to seroepidemiological investigations, prevalence begins at preschool age and is more than 50% for men and more than 70% for men in the 6th decade.

A high prevalence of seropositivity is to be expected: Everyone has probably had contact with *C. pneumoniae* at least once in a lifetime. In fact, 5%-15% of all outpatient cases of acquired pneumonia are caused by *C. pneumoniae*.

**Age group:** 60–80 years

**Etiology and Pathogenesis of Chlamydia**

**Etiology and pathogenesis of Chlamyphila trachomatis**

<table>
<thead>
<tr>
<th>Serotypes A-C:</th>
<th>Infectious eye secretions, contaminated hands and towels (smear infection), flies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serotypes D-K:</td>
<td>Sexually transmitted, perinatal</td>
</tr>
<tr>
<td>Serotypes L1-L3:</td>
<td>Sexually transmitted, causes lymphogranuloma venereum, perinatal</td>
</tr>
</tbody>
</table>

The incubation period is approx. 1-3 weeks.

**Etiology and pathogenesis of Chlamyphila psittaci**

*Psittaci* is the only zoonotic human pathogen from the *Chlamydiaceae* family. The excitation sources are mainly birds (chickens, ducks, pigeons, and exotic birds).

The transfer takes place by direct contact or by inhalation of dust particles or feces containing pathogens.
The pathogens are partly infectious even after drying out for as long as 4 weeks. The incubation period of the ornithosis is about **1-4 weeks**.

**Etiology and pathogenesis of Chlamydia pneumoniae**

*Pneumoniae* is transmitted from person to person in an aerogenic pathway and by salivary contact.

The incubation time is estimated to be about **1-4 weeks**.

*Pneumoniae* may remain persistent for a long time in the upper respiratory tract. It is likely that an infected person will infect others over a long period of time.

**Clinical Findings of Chlamydia**

**Symptoms of Chlamydophila trachomatis infection**

**Urogenital chlamydia infection**

**Note:** 80% of urogenital chlamydia infections in women are symptomatic. The pathogens can persist for years undetected in the body and possibly even become chronic.

Clinical manifestation of *Chlamydophila trachomatis* in men and women

<table>
<thead>
<tr>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Urethritis</td>
<td>• Urethritis: feeling of pressure and pain and burning during urination</td>
</tr>
<tr>
<td>• Conjunctivitis</td>
<td>• Conjunctivitis</td>
</tr>
<tr>
<td>• Reactive arthritis</td>
<td>• Reactive arthritis</td>
</tr>
<tr>
<td>• Bartholinitis</td>
<td>• Prostatitis</td>
</tr>
<tr>
<td>• Cervicitis</td>
<td>• Epididymitis</td>
</tr>
<tr>
<td>• Endometritis</td>
<td>• Peritonitis</td>
</tr>
<tr>
<td>• Salpingitis</td>
<td>• Perihepatitis, -spleenitis</td>
</tr>
<tr>
<td>• Adnexitis</td>
<td></td>
</tr>
<tr>
<td>• Peritonitis</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** If ascending infections persist, they can lead to adhesions in the tubes. Tube adhesions are the most common cause of sterility in women, as well as extrauterine pregnancy and chronic pelvic symptoms.

**Lymphogranuloma venereum**
Lymphogranuloma venereum is caused by the invasive serotypes L1, L2, or L3 of *Chlamydia trachomatis*. This young adult experienced the acute onset of tender, enlarged lymph nodes in the groin. By Herbert L. Fred, MD, and Hendrik A. van Dijk, License: [CC BY 2.0](https://creativecommons.org/licenses/by/2.0)

<table>
<thead>
<tr>
<th>Primary stage</th>
<th>Herpetiform papules, ulcer, rapid scalp-free healing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Secondary stage</td>
<td>Inguinal, painful lymphadenopathy (bubo)</td>
</tr>
<tr>
<td>Tertiary stage</td>
<td>Fibrotic transformation of the lymph nodes, inflammation with ulceration, obliteration of the lymphatics, edema of the genital/extremity (elephantiasis), fever, arthralgia, splenomegaly, erythema nodosum</td>
</tr>
</tbody>
</table>

### Newborn chlamydiosis

Newborn chlamydiosis presents as conjunctivitis (60%) or pneumonia (40%).

**Typical symptoms of inclusion body conjunctivitis are:**

- Purulent, mucopurulent, hemorrhagic inflammation of the conjunctiva
- Eyelid edema
- Follicular infiltration of the inner lid
- First on one side, then on both
- Mostly inconsequential healing

**Typical symptoms of neonatal pneumonia are:**

- Tachypnea
- Increased respiratory effort
- Snorkeling breathing sounds
- Refusal of food
- In severe cases, cyanosis
Follicular keratoconjunctivitis is caused by an initial infection. Repeated infections and, among others, bacterial superinfections lead to the formation of granulomas. The result of the granulomas is scarred shrinkage of the conjunctiva of the eyelids and entropion. Over time, the cornea changes and becomes turbid.

Symptoms and clinical findings of *Chlamydophila psittaci* infection

**The typical symptoms of ornithosis include:**

- Fever, chills, and headaches
- Photophobia
- Atypical and **interstitial pneumonia**
- Dry, persistent, nonproductive **cough**
- Myalgia
- Extrapulmonary manifestations: hepatosplenomegaly (70% of patients), **myocarditis**, **encephalitis**, and exanthema

**Symptoms of Chlamydophila pneumoniae infection**

Frequently, the course of *C. pneumoniae* infections is asymptomatic.

- Acute and chronic infections of the upper respiratory tract (pharyngitis, sinusitis, and **bronchitis**)
- Outpatient **pneumonia**
- All symptoms of infection with *C. psittaci* can also occur in *C. pneumoniae*.

**Complications of Chlamydia**

**Possible complications of chlamydia infection**

<table>
<thead>
<tr>
<th><strong>C. trachomatis</strong></th>
<th><strong>C. psittaci</strong></th>
<th><strong>C. pneumoniae</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Arthritic disorders: joint inflammation</td>
<td>Myocarditis, pericarditis, endocarditis, thrombophlebitis, central nervous system involvement</td>
<td>Carditis, meningoradiculitis, erythema nodosum, reactive arthritis</td>
</tr>
</tbody>
</table>

**Diagnosing Chlamydia**

**Smear for determination of chlamydia pathogens**

The pathogen can be detected via:

- **Trachoma**: conjunctiva smear
- **Eye infection**: conjunctiva smear
- **Urogenital infections**: cervical or vaginal smear, possibly urethral smear
- **Lymphogranuloma venereum**: lymph node aspirate, ulcer smear

Direct detection of chlamydia antigens can be carried out by **fluorescence-labeled antibodies** or **enzyme-linked immunosorbent assay**. Alternative with high specificity and sensitivity is **polymerase chain reaction (PCR)**.
The pathogen is **detected indirectly** by serum antibody determinations. It must be specifically investigated for the appropriate species (i.e., *Chlamydia trachomatis*, *C. pneumoniae*, or *C. psittaci*). The diagnosis of genital chlamydia evolved rapidly from the 1990s through 2006. Nucleic acid amplification tests (NAATs), such as **PCR**, **transcription-mediated amplification (TMA)**, and **DNA strand displacement amplification (SDA)**, now are mainstays.

### Differential Diagnosis of Chlamydia

#### Chlamydia infection and similar medical conditions

<table>
<thead>
<tr>
<th><em>C. trachomatis</em></th>
<th><em>C. psittaci</em></th>
<th><em>C. pneumoniae</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Gonococcal urethritis</td>
<td>Pathogens that trigger atypical pneumonia:</td>
<td>See <em>C. psittaci</em></td>
</tr>
<tr>
<td>• Trichomonad mycoplasma urethritis: inflammation of the urethra by mycoplasmas, bacteria type without the cell wall</td>
<td>• Legionellosis</td>
<td></td>
</tr>
<tr>
<td>• Urethritis caused by several different bacteria or viruses (e.g., <a href="https://en.wikipedia.org/wiki/Herpes_simplex_virus">herpes simplex virus</a>)</td>
<td>• Influenza</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Typhoid</td>
<td></td>
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<tr>
<td></td>
<td>• Spotted fever</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Sepsis</td>
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</tr>
</tbody>
</table>

### Therapy of Chlamydia

#### Antibiotics

The drugs of choice in chlamydia are **antibiotics**.

<table>
<thead>
<tr>
<th><em>C. trachomatis</em></th>
<th><em>C. pneumoniae, C. psittaci</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetracyclines (doxycyclin)</td>
<td>Tetracyclines (doxycyclin)</td>
</tr>
<tr>
<td>• Macrolides (erythromycin, clarithromycin)</td>
<td>Macrolides (erythromycin, azithromycin)</td>
</tr>
<tr>
<td>• Quinolones (levofloxacin, moxifloxacin)</td>
<td></td>
</tr>
<tr>
<td>• Azithromycin (in uncomplicated genital infections, single dose)</td>
<td></td>
</tr>
<tr>
<td>Duration of treatment: at least 14 days</td>
<td>Duration of treatment: 10–21 days</td>
</tr>
</tbody>
</table>

**Note:** Especially important in the treatment of *C. trachomatis* is the **co-treatment of the partner** to avoid constant re-infection (the so-called ‘ping-pong effect’).
Prevention of Chlamydia

Prevention measures for *C. trachomatis*

- Follow the principles of preventing sexually transmitted infections.
- Since January 1, 2008, many sexually active women younger than 25 years have been offered chlamydia screening (which may be reimbursed by health insurance).
- Trachoma: **SAFE** strategy, a global program for the elimination of trachoma from the World health organization: surgery + antibiotics + facial cleanliness + environmental improvement

Prevention measures for *C. psittaci*

- Compulsory reporting: compliance with the veterinary rules of disease control
- Early diagnosis and therapy in cases of suspicion

Notification requirement

Which chlamydia infection is notifiable?

- *Trachomatis*
- *Psittaci*
- *Pneumoniae*

References


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