Gonorrhea & Chlamydia

By: Brianna Nofziger and Kate Hasty
History of Chlamydia

- First discovered by Albert Neisser, Ludwig Halberstaedter and Stanislaus Von Prowazek in 1903 while studying Syphilis

- By inoculating the eyes of orangutans with the scrapings of trachoma infected eyes of humans, they found that the monkey’s soon developed conjunctiva inclusions.

- The same inclusions were found in the conjunctiva of infants, cervix of mothers and urethral sample scrapings from men.

- Distinguished as *Chlamydia trachomatis* (C. Trachomatis)
Gonorrhea History

- The exact time of onset of gonorrhea as prevalent disease or epidemic cannot be determined. We currently base the timeline of gonorrhea off of scholarly quotes that date back to 1161 reading “...the perilous infirmity of burning,” to compare to similar symptoms of the disease today. However, it cannot be proven.
Chlamydia Factoids

• Derived from the Greek word, “Chlamys,” meaning, “cloak draped around shoulder.”

• Relation to Bacteria characteristics: intracytoplasmic inclusions are caused by Chlamydia bacteria when they drape around the host’s nucleus.

• Chlamydia is the most common STD in the United States, infecting approximately 3 million people each year according to the CDC.

• Very easy to treat but most often people who have contracted Chlamydia do not show any symptoms and do not realize they have it, and continue to spread it to others.

• An annual $2.7 Billion is spent on the diagnosis and treatment of Chlamydia!
Chlamydia & Gonorrhea Case Example

- A male college student began experiencing discomfort during urination and noticed some unusual yellowish discharge from his penis. He had never experienced symptoms like these before and consulted his doctor about the situation. After describing his symptoms to his doctor, his doctor asked him if he was currently in a sexual relationship or had been recently sexually active. The student explained that he had been dating someone for the past few months and had recently become sexually active. The doctor took a urine sample and ran some lab tests that revealed that the boy was positive for Chlamydia. The boy explained that his girlfriend was sure that she did not have any STD’s and was confused how he had contracted Chlamydia. His doctor explained that it is very common for people who have Chlamydia to show no symptoms and therefore are not aware that they are passing it on to other intimate partners. He encouraged the boy to inform his girlfriend of the situation and the make sure she became tested to avoid further complications such as pelvic inflammatory disease and infertility. The doctor then prescribed him with antibiotics to be taken for a week and advised him to avoid sexual interaction until the infection subsided.
Chlamydia Characteristics

- Bacterium
- Size: 0.3 - 0.4nm
- Shape: Coccus and sometimes Bacillus
- Motility: small needle-like projection that aids in protein injection to the host cell and helps avoid lysosomes
- Staining Characteristics: Gram Negative. No peptidoglycan in cell wall but contains lipopolysaccharides. Very difficult to stain and resistant to antibiotics due to an unusual cell wall that is hard to target.
- Metabolic/growth characteristics: Chlamydia do not generate their own ATP, they are completely dependent on the host for energy.
Gonorrhea Characteristics

- Bacterium: *Neisseria gonorrhoeae*
- Gram-negative, diplococci, motile (twitching motility)
- Culture Characteristics: Require nutrient supplementation to grow in laboratory cultures. They grow on chocolate agar with carbon dioxide.
- Size: 0.6-1.0 µm
Chlamydia Virulence Factors

- Cell Wall = Gram Negative

- Resistant to some antibiotics such as penicillin since its cell wall does not contain peptidoglycan and is not typical (difficult to target)

- Does not contain a specific acid in the cell wall

- Lipopolysaccharides: damage host and aid in bacterial survival
Gonorrhea Virulence Factors

- Virulence Factors: Possess pili to adhere to surfaces which eventually leads to permutations to the surface of proteins and in turn makes it more difficult for host immune cells to recognize *N. gonorrhoeae* and send a defense.

- Contain surface proteins that bind to receptors on immune cells, which prevents an immune response.

- The host is also unable to develop an immunological memory against *N. gonorrhoeae*, which means that future reinfection is possible.
Chlamydia Pathophysiology

• The site where the infection was contracted determines what type of symptoms occur.

• Chlamydia effects mucosal membranes including the cervix, rectum, urethra, throat and eyes.

• The contraction of chlamydia can lead to serious side effects such as trachoma, which causes blindness. The transmission of trachoma occurs through the transmission of eye discharge. The presence of the infected eye discharge leads to inflammation in the eye which produces scar tissue. The scar tissue causes the eye to turn inward and the eye lashes to irritate the cornea, causing scarring.

• If untreated in females, chlamydia can cause: Pelvic Inflammatory Disease, chronic pelvic pain and fertility issues.
Chlamydia
Pathophysiology cont.

- Women Symptoms: Unusual vaginal discharge, and possible burning sensation when urinating
- Male Symptoms: Discharge from penis and burning sensation when urinating.
- Often has no symptoms and if symptoms do show, they could be from a sexual encounter from weeks ago.
Gonorrhea Description

- Purulent infection of the mucous membranes. Spread through sexual contact.
- The incubation period: the time from exposure to the bacteria until symptoms develop, is usually 2 to 5 days.
Gonorrhea Symptoms

- Women: The most common presenting symptom of gonorrhea, vaginal discharge from endocervicitis is usually described as thin, purulent, and mildly odorous; however 80% of females are asymptomatic.

- Men: initial characteristics include burning upon urination and a serous discharge; a few days later, the discharge usually becomes more profuse, purulent, and, at times, tinged with blood
Chlamydia Transmission & Development

- Vaginal, anal and oral sexual transmission.
- Elementary Form: Infectious form
- Reticulate Form: Metabolically active form
- During a sexual encounter, chlamydia enters a host cell through phagocytosis and binds to specific acid receptors found in the mucous membrane. The rigid membrane of the bacteria inhibits the fusion of the endosome and the lysosome which in turn allows it to survive and avoid termination. Once successfully engulfed into the host cell, the elementary form of the bacteria transitions into the reticulate form to begin binary fission. The vacuole that was inside the elementary form of the bacteria is now the reticulate form that is able to replicate. After replication occurs the reticulate form returns to its elementary form and is exocytosed.
Chlamydia Life Stages

Developmental cycle of *C. trachomatis*

- **0 hours**: Elementary body (EB)
- **0.5 hours**: Epithelial cell
- **1-8 hours**: Nucleus, inclusion
- **48-72 hours**: Reticulate body (RB)
- **40 hours**: Reticulate body (RB)
- **30 hours**: Reticulate body (RB)
- **24-30 hours**: Reticulate body (RB)

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Chlamydia Diagnosis Process

- The diagnosis process for Chlamydia and Gonorrhea are similar in that lab testing through urine samples or through genital swabbing reveal the infection.

- Both Gonorrhea and Chlamydia can occur at the same time.

- In 2011, Oregon reported 1,490 cases of Gonorrhea and approximately 14,000 cases of Chlamydia!

Chlamydia Diagnosis Rate

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Gonorrhea Diagnosis

• After initial symptoms it is important to see your physician who will then take a sample of body fluid or urine to test if the bacteria is present. If present, injectable gentamicin combined with oral azithromycin has shown 100% effectiveness in curing genital gonorrhea infections.

• Avoiding sexual contact is the best way to prevent this disease.
Prevention & Treatment

- Practicing safe sex by using condoms
- Getting tested at least once a year if sexually active
- Sharing sexual history with past and future sexual partners
The treatment for both Gonorrhea and Chlamydia include antibiotics such as a single dose of azithromycin or a week of doxycycline twice daily.
Why are these important diseases to study?

- It is important to study these diseases to learn more about the transmission to prevent them from spreading and infecting more people everyday.

- Spreading awareness about these diseases can prevent transmission and in turn lower the billions of dollars spent on treatments.
THE END!
References:


