Chlamydia and Gonococcal Infections
DISCLOSURE

• I have no financial interests or other relationship with manufacturers of commercial products, suppliers of commercial services, or commercial supporters. My presentation will not include any discussion of the unlabeled use of a product or a product under investigational use.
An STD About to Happen!
Cell Monolayer Infected with Chlamydia and Stained with Chlamydia Specific Fluorescent Antibodies

Cell cytoplasm counter stained red

Chlamydial inclusions stained apple green
Cervical Specimen
Thayer-Martin Medium

Positive Colonial Morphology
Electron Micrograph of a Chlamydia Infected Endocervix

- Chlamydial inclusion
- Columnar epithelial cells
- Microabscess
Gonococcal Urethritis
Gram Negative Intracellular Diplococci (GNID)
Nongonococcal Urethritis
Inflammation Without GNID
# Etiology of Nongonococcal Urethritis

<table>
<thead>
<tr>
<th>Organism</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Chlamydia trachomatis</em></td>
<td>20-40%</td>
</tr>
<tr>
<td><em>Mycoplasma genitalium</em></td>
<td>15-25%</td>
</tr>
<tr>
<td><em>Ureaplasma urealyticum</em></td>
<td>10-20%</td>
</tr>
<tr>
<td><em>Trichomonas vaginalis</em></td>
<td>5-15%</td>
</tr>
<tr>
<td>Adenovirus</td>
<td>1-4%</td>
</tr>
<tr>
<td>Herpes simplex virus</td>
<td>1-2%</td>
</tr>
</tbody>
</table>
Mycoplasma genitalium
Adenovirus Urethritis

O’Mahony C. International J STI and AIDS. 2006;17:203
Epidydimitis

- Scrotal erythema
- Discharge
Gonococcal Endocervicitis
Chlamydial Endocervicitis
## Etiology of PID

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>N. gonorrhoeae</em></td>
</tr>
<tr>
<td>2.</td>
<td><em>C. trachomatis</em></td>
</tr>
<tr>
<td>3.</td>
<td>Mixed aerobes and anaerobes including <em>Mycoplama hominis</em> + <em>N. gonorrhoeae</em></td>
</tr>
</tbody>
</table>

- 1. *N. gonorrhoeae*: 20-40%
- 2. *C. trachomatis*: 20%
- 3. Mixed aerobes and anaerobes including *Mycoplama hominis* + *N. gonorrhoeae*: 40-60%
Diagnosis of PID

History

1. Lower abdominal pain of less than 15 days duration
2. Constant pain
3. Onset within 7 days of menstruation
4. Fever and/or chills
5. Sexual history
Diagnosis of PID

Signs

1. Bilateral adnexal tenderness
2. Cervical motion pain
3. Adnexal mass
4. Endocervical discharge
Maternal Chlamydial Infection

- 65% of infants are infected
- 30 – 50% of infants develop conjunctivitis
- 5% of infants develop pneumonia
Proportion of Chlamydial and Gonococcal Infections that are Asymptomatic

<table>
<thead>
<tr>
<th></th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>C. trachomatis</em></td>
<td>80-90%</td>
<td>70-80%</td>
</tr>
<tr>
<td><em>N. gonorrhoeae</em></td>
<td>50-70%</td>
<td>20-30%</td>
</tr>
</tbody>
</table>
Epidemiology

Rate (per 100,000 population)

Rate (per 100,000 population)

1989 91 93 95 97 99 2001 03 05 07

Men
Women
Total

Rate (per 100,000 population)

- West
- Midwest
- Northeast
- South

Year: 1999–2008
Chlamydia — Rates: Total and by sex:
United States, 1987–2007

Note: As of January 2000, all 50 states and the District of Columbia had regulations requiring the reporting of chlamydia cases.
Relationship of Age to Chlamydial Infection

% Infected

Age

16 18 20 22 24 26 28 >= 30

<table>
<thead>
<tr>
<th>Age</th>
<th>Men Rate (per 100,000 population)</th>
<th>Women Rate (per 100,000 population)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total 103.3</td>
<td>Total 119.7</td>
</tr>
<tr>
<td>10-14</td>
<td>433.6</td>
<td>636.8</td>
</tr>
<tr>
<td>15-19</td>
<td>278.3</td>
<td>608.6</td>
</tr>
<tr>
<td>20-24</td>
<td>163.3</td>
<td>28.9</td>
</tr>
<tr>
<td>25-29</td>
<td>99.6</td>
<td>11.2</td>
</tr>
<tr>
<td>30-34</td>
<td>71.7</td>
<td>2.5</td>
</tr>
<tr>
<td>35-39</td>
<td>40.1</td>
<td>0.5</td>
</tr>
<tr>
<td>40-44</td>
<td>14.0</td>
<td></td>
</tr>
<tr>
<td>45-54</td>
<td>3.5</td>
<td></td>
</tr>
<tr>
<td>55-64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65+</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The chart visually represents the rate data, with bars for both men and women across different age groups. The values are given in rates per 100,000 population.
Diagnosis
Gram Negative Intracellular Diplococci (GNID)
One Step Methylene Blue Stain
Performance of Urethral and Endocervical Culture for *N. gonorrhoeae* and *C. trachomatis*

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>N. gonorrhoeae</em></td>
<td>80-90%</td>
<td>100%*</td>
</tr>
<tr>
<td><em>C. trachomatis</em></td>
<td>60-85%</td>
<td>100%*</td>
</tr>
</tbody>
</table>

*Assuming no mistakes are made in specimen labeling and laboratory procedures.*
### Chlamydia Test Sensitivity and Specificity Estimates for Endocervical Specimens

<table>
<thead>
<tr>
<th>Assay</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture</td>
<td>65-80%</td>
<td>99.5%</td>
</tr>
<tr>
<td>Antigen detection</td>
<td>50-60%</td>
<td>98%</td>
</tr>
<tr>
<td>Gen-Probe</td>
<td>60-70%</td>
<td>98-99%</td>
</tr>
</tbody>
</table>
Performance of the Pace 2 Gonococcal DNA Hybridization Assay in Women

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of 10 studies</td>
<td>85-100%</td>
<td>96-99%</td>
</tr>
<tr>
<td>Mean</td>
<td>92.1%</td>
<td>98.3%</td>
</tr>
</tbody>
</table>
PCR AMPLIFIES A TARGETED SEQUENCE
POLYMERASE CHAIN REACTION (PCR)
Nucleic Acid Amplification Test (NAAT)
Sensitivity for Chlamydia Infections

<table>
<thead>
<tr>
<th>Assay Type</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urine</td>
<td>Cervix</td>
</tr>
<tr>
<td>PCR</td>
<td>86%</td>
<td>88%</td>
</tr>
<tr>
<td>TMA</td>
<td>99%</td>
<td>96%</td>
</tr>
<tr>
<td>SDA</td>
<td>99%</td>
<td>92%</td>
</tr>
</tbody>
</table>

PCR-polymerase chain reaction. TMA-transcription mediated amplification. SDA-strand displacement amplification.

Performance of a NAAT for the Detection of *N. gonorrhoeae*

<table>
<thead>
<tr>
<th></th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Endocervical</td>
<td>97%</td>
<td>99.7%</td>
</tr>
<tr>
<td>Male urethra</td>
<td>99%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Female urine</td>
<td>96%</td>
<td>100%</td>
</tr>
<tr>
<td>Male urine</td>
<td>98%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Potential Urine Based Screening Opportunities

- Juvenile detention/jails
- Emergency departments
- High schools
- General medicine clinics, especially teen clinics
- Drug rehabilitation programs
- Homeless clinics
- Military induction centers
Chlamydia Prevalence in High School Students by Age

![Graph showing Chlamydia prevalence by age and gender. The x-axis represents age (14 to 19 years) and the y-axis represents prevalence (%). The graph indicates a higher prevalence in girls compared to boys. The data points are as follows:

- Boys (n=1,625):
  - 14 years: 0.8%
  - 15 years: 2.1%
  - 16 years: 4.6%
  - 17 years: 12.8%
  - 18 years: 14.3%
  - 19 years: 14.3%

- Girls (n=1,425):
  - 14 years: 0.4%
  - 15 years: 1.2%
  - 16 years: 4.6%
  - 17 years: 14.0%
  - 18 years: 15.3%
  - 19 years: 15.3%]
Age Specific Chlamydia Infection Rates in Washington State

<table>
<thead>
<tr>
<th>Assay</th>
<th>FCU</th>
<th>Cx</th>
<th>S-vag</th>
<th>C-vag</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMA</td>
<td>72%</td>
<td>89%</td>
<td>93%</td>
<td>90%</td>
</tr>
<tr>
<td>PCR</td>
<td>84%</td>
<td>91%</td>
<td>91%</td>
<td>93%</td>
</tr>
<tr>
<td>LCR</td>
<td>98%</td>
<td>96%</td>
<td>98%</td>
<td>100%</td>
</tr>
<tr>
<td>Combined</td>
<td>81%</td>
<td>91%</td>
<td>93%</td>
<td>93%</td>
</tr>
</tbody>
</table>

Testing Preference Survey Among 1090 Women Following a Pelvic Examination and a SOVs Protocol

- 90% found self collection of vaginal swabs very easy and another 7% found it somewhat easy.
- 76% preferred a SOVs over a pelvic examination. 60% preferred it over a urine specimen.
- 94% said they would be tested for STIs more often if SOVs were available.

Chernesky MA, et al. Sex Transm Dis 32; 2005:729
Treatment
Gonococcal Isolate Surveillance Project (GISP) — Penicillin, tetracycline, and ciprofloxacin resistance among GISP isolates, 2008
Percentage of Fluoroquinolone-resistant *N. gonorrhoeae* – Hawaii, 1993-2001

The graph shows the percentage of Fluoroquinolone-resistant *N. gonorrhoeae* in Hawaii from 1993 to 2001. The percentage increased significantly from 1993 to 2001, with a peak in 2001.
GISP Project: *N. gonorrhoeae* isolates with resistance or intermediate resistance to ciprofloxacin - 2008

Gonorrhea resistance and intermediate resistance to ciprofloxacin from 1990 to 2008.
2006 CDC STD Treatment Guidelines

Uncomplicated Gonococcal Infections

- Recommended Regimens
  - **Cefixime** 400 mg orally in a single dose
  - or
  - **Ceftriaxone** 125 mg IM in a single dose
  - or
  - **Ciprofloxacin** 500 mg orally in a single dose
  - or
  - **Levofloxacin** 250 mg orally in a single dose

*PLUS (If chlamydia not ruled out)*

- **Doxycline** 100 mg orally 2 times a day for 7 days
  - or
  - **Azithromycin** 1 gm orally
• Alternative Regimens

  **Spectinomycin** 2 g IM single dose

  **Other single dose IM Cephalosporins** (cefotaxime 500 mg, cefoxitin 2 g + probenecid, etc.)

  **Other single dose Quinolones** (enoxacin 400 mg, lomefloxacin 400 mg, norfloxacin 800 mg)

  **Azithromycin** 2 grams as a single dose/
2006 CDC STD Treatment Guidelines

Chlamydial Infections

- Recommended Regimens

  **Azithromycin** 1 gram, orally, single dose

  **Doxycycline** 100 mg orally 2 times a day for 7 days
2006 CDC STD Treatment Guidelines

Nongonococcal Urethritis (NGU)

- Recommended Regimens
  - **Azithromycin** 1 gram, orally, single dose
  - **Doxycycline** 100 mg orally 2 times a day for 7 days
2006 CDC STD Treatment Guidelines

Persistent or Recurrent NGU

**Metronidazole** 2 grams, orally, single dose

**OR**

**Tinidazole** 2 grams, orally, single dose

**PLUS**

**Azithromycin** 1 gram, orally, single dose (if not used previously)
2006 CDC STD Treatment Guidelines

Chlamydial Infection During Pregnancy

• Recommended Regimens

  **Azithromycin** 1 gram, orally, single dose

  OR

  **Amoxicillin** 500 mg orally 3 times daily for 7 days
2006 CDC STD Treatment Guidelines

Mild PID

- Recommended Regimen B
  **Ceftriaxone** 250 mg IM once
  **PLUS**
  **Doxycycline** 100 mg orally 2 times a day for 14 days

WITH OR WITHOUT

**Metronidazole** 500 orally 2 times daily for 14 days
Just a little sunshine…
Just a little rain...
Just a little pleasure…
AND THEN....
Just a little PAIN!!
Vaginal Swab Study Specimen Collection Illustration

1. Take the swab out of the sealed package

2. Remove the swab and hold it in the middle of the plastic handle

3. Carefully put the swab about two inches inside the opening of your vagina and gently turn the swab for 20 seconds. Make sure the swab touches the walls of your vagina

4. Remove the cap from the tube and put the swab into the tube so that you can see the tip is below the label

5. Carefully break the plastic handle against the side of the tube

6. Tightly screw the cap onto the tube. Follow the packaging instructions and mail the specimen