What’s New: STDs

Seema Nayak, MD
Johns Hopkins University
Financial Disclosures

• None

• Will discuss experimental gonorrhea treatment options that are in the published literature
Objectives

• Discuss screening and management of syphilis
• Describe clinical manifestations and treatment of ocular syphilis
• Define screening and treatment recommendations for gonorrhea
SYMPHILIS
Syphilis in the U.S.
Syphilis in the U.S.
Syphilis in the U.S.
Syphilis in Maryland

- 449 cases reported cases in 2014
- Highest rates in Baltimore City and PG county
- 197 cases in Baltimore City (rate: 30.8 per 100K population)
- 257 in all counties
## Bacterial STIs in Maryland

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Allegany</td>
<td>239</td>
<td>210</td>
<td>-12.9%</td>
<td>39</td>
<td>44</td>
<td>12.8%</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Carroll</td>
<td>227</td>
<td>254</td>
<td>11.9%</td>
<td>21</td>
<td>29</td>
<td>38.1%</td>
<td>2</td>
<td>1</td>
<td>-50.0%</td>
<td>5</td>
<td>8</td>
<td>60.0%</td>
</tr>
<tr>
<td>Frederick</td>
<td>601</td>
<td>505</td>
<td>-16.0%</td>
<td>83</td>
<td>77</td>
<td>-7.2%</td>
<td>3</td>
<td>9</td>
<td>200.0%</td>
<td>7</td>
<td>18</td>
<td>157.1%</td>
</tr>
<tr>
<td>Garrett</td>
<td>45</td>
<td>28</td>
<td>-37.8%</td>
<td>4</td>
<td>2</td>
<td>-50.0%</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Washington</td>
<td>381</td>
<td>409</td>
<td>7.3%</td>
<td>135</td>
<td>137</td>
<td>1.5%</td>
<td>5</td>
<td>9</td>
<td>80.0%</td>
<td>5</td>
<td>16</td>
<td>220.0%</td>
</tr>
<tr>
<td>WM Counties</td>
<td>1,493</td>
<td>1,406</td>
<td>-0.6%</td>
<td>282</td>
<td>289</td>
<td>0.2%</td>
<td>10</td>
<td>19</td>
<td>90.0%</td>
<td>17</td>
<td>42</td>
<td>147.1%</td>
</tr>
<tr>
<td>MD State</td>
<td>23,631</td>
<td>23,813</td>
<td>0.8%</td>
<td>5,185</td>
<td>5,742</td>
<td>10.7%</td>
<td>400</td>
<td>376</td>
<td>-6.0%</td>
<td>861</td>
<td>930</td>
<td>8.0%</td>
</tr>
</tbody>
</table>
Clinical Stages of Syphilis

- **Exposure**: 9-90 days
- **Primary**: 4-10 weeks
- **Secondary**: variable
- **Latent**: 3-30 years
  - **Late Latent**: > 12 months
  - **Early Latent**: < 12 months
- **Tertiary**: variable
Clinical Stages of Syphilis
Syphilis Pathogenesis

• Enters via skin or mucus membranes
• Divides every 30-33 hours
• Smaller the inoculum, longer the incubation period (10-90 days)
• Primary lesion (chancre) results at this site of inoculation about 3-6 weeks after initial infection
• Chancre heals spontaneously, usually without scar, within 3-8 weeks
Syphilis: Clinical Manifestations
Secondary syphilis

- *T. pallidum* can traverse the tight junctions between endothelial cells to enter the perivascular spaces, where large number of treponemes and immune cells accumulate.
- It can induce production of MMP-1, which degrades collagen and may facilitate access to and egress from the bloodstream, resulting in systemic spread.
- Usually within 3 months of infection, symptoms of secondary syphilis appear.
Syphilis Pathogenesis

Secondary syphilis

- Skin, mucosae, lymph glands
  - Conjunctivitis
    - Scleritis
    - Episcleritis
    - Interstitial keratitis
    - Uveitis
    - Iritis
    - Vitritis
    - Choroidoretinitis
    - Retinitis
    - Retinal vasculitis
    - Optic neuritis
    - Pupillary abnormalities
- Eye
- Nervous system
  - Meningitis asymptomatic
  - Meningoencephalitis
  - Cerebral infarction
  - Spinal cord infarction
  - Cranial neuropathy
- Lung
  - Pneumonitis
  - Subpleural nodules
  - Pleural effusion
- Musculoskeletal
  - Arthritis
  - Periostitis
  - Bursitis
- Kidney
  - Glomerulonephritis
  - Nephrotic syndrome
- Digestive tract
  - Parotitis
  - Gastritis
  - Gastric ulceration
  - Hepatitis
  - Clinical subclinical
  - Hepatomegaly
  - Splenomegaly
  - Proctitis

Courtesy of Anne Rompalo
Syphilis: Clinical Manifestations
Syphilis Pathogenesis

- Eventually, the host suppresses the secondary infection enough so that no lesions are clinically apparent
- This is latency; 60-85% of patients remain asymptomatic
- Some progress to tertiary stage in 1-20 years
- Immunity is present with chronic infection but lost after treatment
Latent syphilis

• No clinical manifestations
• Only evidence is positive serology
• Early latent syphilis: <1 year duration
• Late latent syphilis: >1 year duration
Tertiary Syphilis

• Late benign syphilis:
  – gummatous lesions in skeletal, spinal and mucosal areas, eye and viscera
  – average onset 4-12 years

• Cardiovascular syphilis:
  – endarteritis of aortic vasovasorum
  – present as aortic aneurysm, Aortic insufficiency
  – average onset 15 years

• Late Neurosyphilis
  – General paresis
  – Tabes dorsalis
Syphilis: Clinical Manifestations
Syphilis Therapy: 1°, 2°, Early latent

- Penicillin is treatment of choice: Benzathine PCN 2.4 million units IM x1
- No documented resistance
- Penicillin alternatives
  - Doxycycline, ceftriaxone
  - Azithromycin (NOT in MSM or pregnancy) – reports of treatment failures (23s rRNA mutations)
- Pregnancy: only use PCN! Desensitize if necessary
Syphilis Therapy: Late latent

- Benzathine penicillin G 7.2 million units total, given as three doses of 2.4 million units IM each at 1-week intervals
- All should be tested for HIV
- Any patient with neurologic symptoms should be evaluated for neurosyphilis
- Same therapy for HIV+
- Also used for tertiary syphilis with a normal CSF exam
- Pregnancy: only use PCN! Desensitize if necessary
What if they miss a week?

• Pharmacology data suggest that an interval of 7-9 days between doses is optimal
• Guidelines do allow for 10-14 day interval based on clinical experience
• If the patient is pregnant, adhere strictly to the weekly dose regimen. If she misses a week, start over
What stage(s) of syphilis involves the eye?

• All stages of syphilis can involve the eye
• Eye involvement tends to occur most frequently in secondary syphilis and late syphilis
What part of the eye is involved?

• **Every** part of the eye can be involved during **any** stage of the infection

• The vast majority of eye problems associated with syphilis are also associated with many other infectious and non-infectious diseases.
  – In other words, there are almost no eye findings that are absolutely specific for syphilis
Ocular Syphilis

Manifestations:
- Conjunctivitis, scleritis, and episcleritis
- **Uveitis**: anterior and/or posterior
- Elevated intraocular pressure
- **Chorioretinitis**, retinitis
- Vasculitis

Symptoms:
- Redness
- Eye pain
- Floaters
- Flashing lights
- Visual acuity loss
- Blindness

Diagnosis:
- Ophthalmologic exam
- Serologies: RPR, VDRL, treponemal tests
- Lumbar puncture

Ocular Syphilis

Photo Courtesy: Dr. Kees Rietmeijer, STD Control, Denver PHD
### Review of 35 patients (61 eyes) from 1984-2014

**Clinical Features and Incidence Rates of Ocular Complications in Patients With Ocular Syphilis**

**AHMADREZA MORADI, SHERVEEN SALEK, EBENEZER DANIEL, SAPNA GANGAPUTRA, TRUCIAN A. OSTHEIMER, BRYN M. BURKHOLDER, THERESA G. LEUNG, NICHOLAS J. BUTLER, JAMES P. DUNN, AND JENNIFER E. THORNE**

**TABLE 2. Clinical Characteristics of Eyes With Ocular Syphilis at Presentation (Continued)**

<table>
<thead>
<tr>
<th>Clinical Characteristics</th>
<th>HIV Negative (N = 26)</th>
<th>HIV Positive (N = 35)</th>
<th>Total (N = 61)</th>
<th>P Value*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ocular complications</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cataract</td>
<td>69.2% (18/26)</td>
<td>33.3% (7/21)</td>
<td>53.2% (25/47)</td>
<td>.02</td>
</tr>
<tr>
<td>Pseudophakia</td>
<td>3.8% (1/26)</td>
<td>3% (1/21)</td>
<td>3.6% (2/47)</td>
<td></td>
</tr>
<tr>
<td>Posterior synechiae</td>
<td>32% (8/26)</td>
<td>45.5% (5/12)</td>
<td>34.2% (13/38)</td>
<td></td>
</tr>
<tr>
<td>Chorioretinitis</td>
<td>38.5% (10)</td>
<td>33.3% (11)</td>
<td>35.6% (21)</td>
<td></td>
</tr>
<tr>
<td>Cystoid macular edema</td>
<td>7.7% (2/26)</td>
<td>0 (0/21)</td>
<td>4.3% (2/47)</td>
<td></td>
</tr>
<tr>
<td>Retinal detachment</td>
<td>7.7% (2)</td>
<td>6% (2)</td>
<td>6.8% (4)</td>
<td></td>
</tr>
<tr>
<td>Optic nerve involvement</td>
<td>3.8% (1)</td>
<td>21.2% (7)</td>
<td>13.56% (8)</td>
<td>.06</td>
</tr>
<tr>
<td>Ocular HTN (IOP &gt;21 mm Hg)</td>
<td>3.8% (1)</td>
<td>4.5% (1/22)</td>
<td>4.2% (2/48)</td>
<td></td>
</tr>
<tr>
<td>Hypotony (IOP &lt;5 mm Hg)</td>
<td>3.8% (1)</td>
<td>4.5% (1/22)</td>
<td>4.2% (2/48)</td>
<td></td>
</tr>
<tr>
<td>Glaucoma</td>
<td>4% (1)</td>
<td>0</td>
<td>1.8% (1)</td>
<td></td>
</tr>
<tr>
<td>Choroidal neovascularization</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Epiretinal membrane</td>
<td>0</td>
<td>4.8% (2/21)</td>
<td>4.4% (2/46)</td>
<td></td>
</tr>
</tbody>
</table>

AC = anterior cell; HIV = human immunodeficiency virus; HTN = hypertension; IOP = intraocular pressure.

*P values were calculated using Fisher exact or 1-sided Fisher exact test.

*Includes optic neuritis, optic atrophy, and optic disc swelling.
Ocular Syphilis

• Ocular signs and symptoms in a person who has syphilis
  – Most diagnoses are presumptive
  – Most patients will have positive serological tests
    • In patients with late ocular syphilis, 30% may have a NEGATIVE serum RPR but all will have a positive serum treponemal test
    • VERY rarely, someone with early syphilis (primary stage) will have negative syphilis serologies (both treponemal and RPR) and eye symptoms
Do you need an LP in someone who only has eye symptoms?

• YES, and here’s why:
  – If the CSF VDRL is positive in someone who has eye symptoms, you can make a DEFINITIVE diagnosis of ocular syphilis (that’s really the only way to make a DEFINITIVE diagnosis)
  – Up to 70% of patients with ocular syphilis will have evidence of neurosyphilis on LP
  – If they have evidence of neurosyphilis, the clinicians will need to follow them with LPs every 6 months to make sure they are responding to therapy
Ocular/Neuro Syphilis: Questions to ask

**Ocular Syphilis**
- Recent change or blurring of vision?
- Do you see flashing lights?
- Do you see spots that move or float by?
- Do you have any eye pain or redness?

**Neurosyphilis**
- Are you having headaches?
- Any new weakness?
- Any trouble walking?
- Any problems with memory or confusion?
- Do you feel that your personality has changed?
What should you do if you suspect someone has ocular involvement?

- In rare cases, syphilis of the eye can progress very rapidly and cause blindness.
- If one suspects that eye symptoms are due to syphilis, patients must be evaluated by an ophthalmologist quickly.
  - If you don’t have access to an ophthalmologist, then patients need to be referred to a local ER.
- If the ophthalmologist finds evidence of eye involvement, the patient will likely need a LP.
Diagnosis of Neurosyphilis

• Neurologic, ocular, auditory signs/symptoms
• Dx can be made with any combination of:
  – abnormal CSF cell count (> 5 WBC)
  – abnormal CSF protein
  – Reactive CSF-VDRL with or without symptoms
• CSF-FTA yields more false positives, but is very sensitive; some believe a neg CSF-FTA excludes neurosyphilis
Ocular syphilis treatment

• Use the same regimen as neurosyphilis EVEN IF THE LUMBAR PUNCTURE IS NORMAL (remember, 30% of patients with ocular syphilis will have a normal lumbar puncture)

• One should be careful NOT to delay antibiotics while waiting for a lumbar puncture to be done
Ocular/Neurosyphilis Treatment

• **Recommended regimen:**
  – Aqueous Crystalline Penicillin G 18-24 mu IV daily administered as 3-4 million units IV q 4 hr for 10 -14 days

• **Alternative regimen:**
  – Procaine Penicillin G 2.4 mu IM daily plus Probenecid 500 mg PO q d, both for 10-14 days

*Consider: BIC 2.4 million units IM once per week up to 3 weeks after completion of 10-14 day course for late syphilis*
Review: Ocular Syphilis

• Symptoms: pain, redness, loss of vision, double or blurred vision, photophobia, spots
• All should undergo a CSF exam, even if no clinical neurologic findings
• Should be managed with an ophthalmologist
• Treated as neurosyphilis, even with normal CSF exam
• If CSF abnormal, need follow up CSF exam to assess treatment response
Neurosyphilis Follow Up

- If CSF pleocytosis was present initially, a CSF examination should be repeated every 6 months until the cell count is normal.
- If the cell count has not decreased after 6 months, or if the CSF cell count or protein is not normal after 2 years, retreatment should be considered.
Syphilis Diagnosis

• Primary/Secondary Syphilis
  – Lesions?
    • Darkfield microscopy
    • Direct immunofluorescence
    • Polymerase chain reaction (PCR)

• Early Latent Syphilis

• Late Latent Syphilis

• Syphilis of Unknown Duration

• Late Syphilis

Serology
Serologic Tests for Syphilis

Non-treponemal Tests

• Complement fixation tests
• Flocculation tests
  – Rapid Plasma Reagin (RPR)
  – VDRL
  – TRUST

Treponemal Tests

• Fluorescent treponemal antibody absorption (FTA-ABS)
• Treponema pallidum hemaglutination assay (TPHA)
• Treponema pallidum passive particle agglutination assay (TPPA)
• Treponema pallidum immobilization assay (TPI)
• Enzyme immunoassays (EIA)
• Chemiluminescence immunoassays (CIA)
• Microbead immunoassays (MBIA)
Treponemal Tests

- Measure antibody directed against *T. pallidum* antigens
- Qualitative (positive or negative)
- Usually reactive for life (but may disappear over time)
Nontreponemal Serologic Tests

• Monitor titers to determine “cure”, “failure”, “reinfection/relapse”

• After therapy:
  – Cure = 4-fold (or 2 dilution) decrease (e.g. from 1:32 to 1:8)
  – Failure = no change or increase
  – Reinfection = documented titer response then a 4-fold increase
Screening Algorithms

**Traditional algorithm**

- RPR/VDRL
  - No further testing
  - + Treponemal Test
    - - Syphilis unlikely
    - + Syphilis (past or present)

**Reverse algorithm**

- Treponemal Immunoassay
  - No further testing
  - + RPR/VDRL
    - - Confirmatory Treponemal Test
    - + No further testing
# Interpretation of Syphilis Tests

<table>
<thead>
<tr>
<th>Non – T STS RPR</th>
<th>T – STS FTA</th>
<th>Possible diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive</td>
<td>Non-reactive</td>
<td>False positive RPR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>False negative FTA</td>
</tr>
<tr>
<td>Reactive</td>
<td>Reactive</td>
<td>New case – needs treatment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Old case – adequately treated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Old case – inadequately treated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Old case - reininfected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Congenital, other treponemal</td>
</tr>
<tr>
<td>Non- Reactive</td>
<td>Reactive</td>
<td>Old case – treated or untreated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Primary syphilis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prozone reaction – rare</td>
</tr>
<tr>
<td>Non-reactive</td>
<td>Non-reactive</td>
<td>No syphilis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Incubating/early primary syphilis</td>
</tr>
</tbody>
</table>
GONORRHEA
Neisseria gonorrhoeae

• Major cause of PID, ectopic pregnancy and infertility
• Can facilitate HIV transmission
• Estimated 1.6 million cases worldwide annually
• 334,826 U.S. cases reported in 2012
• 5742 cases in Maryland in 2015
Screening

• Annually in sexually active women <25 years
• Screening of older women at increased risk
  – New sex partner, partner with concurrent partners or more than one partner, or partner with an STI
  – Co-existing STI
  – Exchanging sex for money or drugs
• Screening older women at low risk of infection not recommended
• Screen MSM at site of exposure
Screening

• Culture: endocervical, urethral, rectal, oropharyngeal, ocular

• NAAT: endocervical, vaginal, urethral swabs; urine (rectal and oropharyngeal if CLIA approved in your lab)
Screening

• Sensitivity of NAAT in urogenital and extragenital sites is superior to culture
• Suspected or documented treatment failure: must do culture for antimicrobial sensitivities
• Follow up everyone three months after treatment (usually re-infection)
Historical Perspective on *Neisseria gonorrhoeae* Antimicrobial Resistance in the United States

1936
- Sulfonamides Introduced

1936-1970s
- Chromosomal PCN & Tetracycline resistance – gradual increase MICs

1945
- Penicillin

Late 1940s
- Tetracycline
- Sulfa Resistance Widespread

1976
- Penicillinase Producing *N. gonorrhoeae* in U.S.

1984
- Plasmid Mediated Tetracycline Resistance

1989
- Ceftriaxone Recommended; Penicillin Dropped

1993
- Quinolones & Cefixime 1st line

2007
- Quinolone Removed from guidelines

2012
- Cefixime removed from 1st line

Proportion of Gonococcal Isolates tested by GISP with CDC 'alert value' MIC to Cefixime*, Ceftriaxone, Azithromycin and with Resistance to Doxycycline and Ciprofloxacin: 2006 - August 2011.

Note different Y-axis scales.

CDC defines alert value MIC to Cefixime as ≥0.25 μg/mL, Ceftriaxone ≥0.125 μg/mL, and Azithromycin ≥2.0 μg/mL. CDC defines doxycycline resistance as MIC ≥2.0 μg/mL and ciprofloxacin resistance as ≥1.0 μg/mL. Cefixime MIC were not tested in 2007 and 2008. Data compiled from CDC STD Surveillance Reports 2006 – 2011.
Fluoroquinolone Resistance

• QRNG: ciprofloxacin MIC ≥ 1 µg/ml
• Prevalence <1% until 2001 → 13.3% in 2006
• Highest rates in W U.S. and in MSM
• 2007: CDC no longer recommends FQs for gonorrhea treatment
Cefixime Resistance

- CDC alert value (elevated MIC): MIC ≥ 0.25µg/ml
- Overall percentage with elevated MICs: 0.1% in 2006 → 1.5% in 2011 → 0.4% in 2013
- Largest increases in Honolulu (0% in 2006 → 17% in 2011) and Minneapolis (0% → 6.9%)
- Steepest MIC increases in MSM
- 2012: Cefixime no longer first line therapy
Cefixime Resistance: U.S.

Percentage of isolates in which minimal inhibitory concentrations (MICs) of cefixime were 0.25 µg per milliliter or higher, 2005–2011. Susceptibility to cefixime was not tested in 2007 or 2008. From the Gonococcal Isolate Surveillance Project.
Cefixime Resistance: UK

*Figure: Change in susceptibility to cefixime between 2007 and 2011. MIC = minimum inhibitory concentration.*

Ison C et al. Lancet Infect Dis 2013;13(9):762-8
Cefixime Resistance: Canada

Figure 1. *N. gonorrhoeae* isolates with elevated MIC of cefixime, by site of infection, BC, 2006 to 2011. Note. Values represent absolute MIC. No isolates had an MIC of 0.5 µg/mL or greater. Sample sizes are indicated in parentheses for each anatomical site and year.

Cefixime Treatment Failures: Canada

- Retrospective cohort study of culture positive gonorrhea, 2010-2011
- 291 culture positive, 133 returned for TOC
- 13 TOC positive, 9 were cefixime rx failures
- Rate of clinical failure with MIC $\geq 0.12\mu g/ml$ was 25%
Cephalosporin Resistance

- Combined effects of several chromosomal mutations:
  - *PenA* (PBP2)
  - *PenB* (PorB1b)
  - *MtrR* (efflux pump over-expression)
  - Mosaic *PenA*
    - Acquired via horizontal transfer from oral commensal bacteria

Other antibiotics

- Tetracycline resistance
  - MIC $\geq 2\, \mu g/ml$
  - Stable from 2006 (20.6%) to 2011 (21.6%)

- Decreased susceptibility to azithromycin
  - MIC $\geq 2\, \mu g/ml$
  - Stable from 2006 (0.2%) to 2011 (0.3%)
Updated Recommendations: GC

• Ceftriaxone 250mg IM + Azithromycin 1g po
• Alternatives:
  – Cefixime 400mg po x1 + azithro 1g po: only if ceftriaxone is not available!
  – Doxycycline 100mg po BID x 7 days can be used in place of azithro if allergic. Needs to be used with a cephalosporin
  – Pharyngeal GC + alternative regimen needs test of cure – if TOC NAAT is positive (treatment failure), need to obtain a culture!
Ceftriaxone resistance

- Resistant strains detected in Japan and Europe
- CDC alert value: ceftriaxone MIC ≥0.125 µg/ml
- 0.05% of isolates in 2013 in U.S.
- Treatment failures are rare, all outside U.S.
- Higher ceftriaxone and/or azithromycin doses recommended outside US (UK, Japan) based on modeling, not clinical data

New Treatment Options

• Gentamicin 240mg IM + azithromycin 2g po
  – 100% cure of genital, rectal, pharyngeal infections
  – High rates of nausea and diarrhea
  – Potential for nephrotoxicity

• 2\textsuperscript{nd} arm with gemifloxacin 320 mg po and azithromycin 2 g po
  – 99.5% urethral/cervical cure rates, 100% rectal and pharyngeal
New Treatment Options

• Solithromycin: novel fluoroketolide
• Phase 2 study of 59 patients had 100% cure rate (only 8 rectal and 4 pharyngeal infections)
• Dose related GI side effects: nausea, vomiting, loose stools

Suspected Treatment Failures

- Most treatment failure likely due to reinfection
- If truly suspected, obtain cultures
- Treatment:
  - If reinfection likely (ceftriaxone/azi), Rx ceftriaxone 250 mg + azithromycin 1 g
  - If reinfection likely (cefixime/azi), Rx ceftriaxone 250 mg + azithromycin 2 g
  - If tx failure suspected, Rx gemifloxacin 320 mg + azithromycin 2 g or gentamicin 240 IM + azithromycin 2 g
- Test of cure in 7-14 days (culture + NAAT)
- Ensure partner treatment
Other options?