Sexually Transmitted Infections: Gonorrhea, Chlamydia, Trichomoniasis, and Human Papillomavirus

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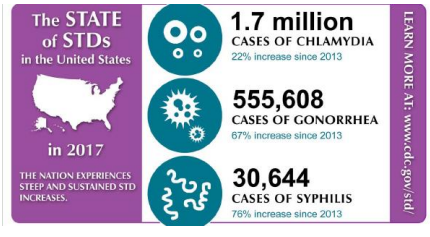
Learning Objectives

After attending this presentation, learners will be able to:

- Describe the current epidemiology of the most common STIs
- Identify current treatment recommendations for gonorrhea, chlamydia, trichomoniasis
- Describe the current trends in gonococcal antimicrobial resistance

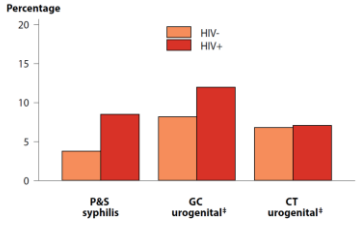
STIs are on the rise in the US



Limitations of case report data

- Not all STDs are nationally notifiable (HPV)
- Most STDs are asymptomatic, only those diagnosed can be reported
- Trends are influenced by screening coverage and reporting practices

Proportion* of MSM Attending STD Clinics with Primary and Secondary Syphilis†, Urogenital‡ Gonorrhea, or Urogenital‡ Chlamydia by HIV Status§, STD Surveillance Network (SSuN), 2017



* Proportions represent the overall average of the mean proportions by jurisdiction.
† Includes SSuN jurisdictions that reported data on at least 20 patients with a diagnosis of primary and secondary syphilis in 2017.
‡ Includes results from both urethral and urine specimens.
§ Excludes all persons for whom there was no laboratory documentation or self-report of HIV status.

- 10-12 State Health Departments (SSuN)
- Visit level data
- Enhanced case data
- Common protocols

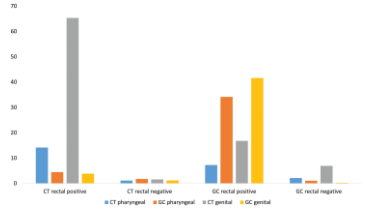
STI Testing during HIV care

- Initial care visit
  - Syphilis serology
  - NAAT (gonorrhea, chlamydia)
    - MSM (rectum, pharynx, urethra)
  - Hepatitis A,B, C
  - Women- Cervical pap test (HIV OI guidelines); Trichomonas (NAAT)
- Screening dependent on risk (3-6 mo)
  - New sex partner, partner with concurrent partners or more than one partner, or partner with an STI
- High risk behavior
  - Partner services, prevention counseling

2015 Treatment Guidelines, HIVMA 2014

What about Rectal GC/CT Screening for women?

- 5499 women rectal CT/GC tests + other sites rectal positivity 10.8%
- ~ ½ + GC/CT had a rectal infection only

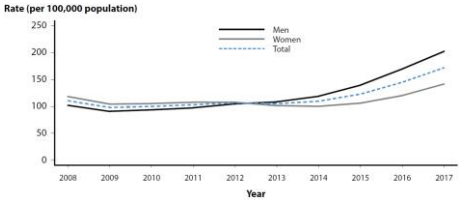


Women with rectal GC/CT rectum were more likely to have genital or pharyngeal GC/CT

Tao G, Clinical Infectious Diseases 2018; 66 (4): 570-5

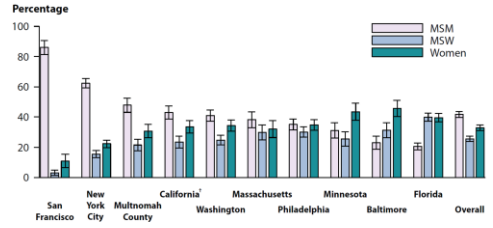
Gonorrhea

Gonorrhea — Rates of Reported Cases by Sex, United States, 2008–2017



During 2012-2017, the rates of reported GC increased:
- **112% among males**
- **40% among females**

Estimated Proportion* of MSM, MSW, and Women Among Gonorrhea Cases by Jurisdiction, STD Surveillance Network (SSuN), 2017



* Estimate based on weighted analysis of data obtained from interviews (n=6,409) conducted among a random sample of reported gonorrhea cases during January to December 2017.
† California data exclude San Francisco (shown separately).

Gonorrhea Clinical Manifestations

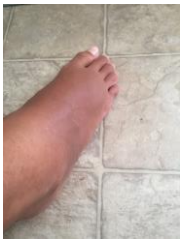
	Anatomic Site	Syndrome
Males	Urethra	Urethritis
	Epididymis	Epididymitis
	Pharynx	Asymptomatic, Nasopharyngitis
	Rectum	Asymptomatic, Proctitis
	Eye	Conjunctivitis
	Systemic	Disseminated Gonococcal Infection (DGI)
Females	Cervix	Cervicitis
	Fallopian tube	Salpingitis/Pelvic Inflammatory Disease
	Urethra	Urethritis
	Epididymis	Epididymitis
	Pharynx	Asymptomatic, Pharyngitis
	Rectum	Proctitis
	Eye	Conjunctivitis
	Systemic	Disseminated Gonococcal Infection (DGI)

Clinical Case—ARS Question 1

- 23 yo female G4P1
- Ankle swelling, pain, migratory polyarthritis, skin lesion left finger

What is the best method to make a diagnosis of DGI?

1. Joint aspiration
2. Blood culture
3. Lesion aspiration
4. Vaginal swab



Polling Open Now

Disseminated Gonococcal Infection (DGI)

- Estimated to account for 0.5-3% of gonococcal infections
- Risk factors: female, menses, pregnancy , terminal complement deficiency
- Clinical presentation
  - Monoarticular arthritis
  - skin lesions (petechial or pustular) + tenosynovitis + polyarthralgia
  - Perihepatitis, endocarditis, meningitis
- +Blood cx tenosynovitis/arthralgia > monoarticular arthritis
- Mucosal site infection often asymptomatic (NAAT)
- Antimicrobial susceptibility (AST) testing (culture)

Changing Patterns of DGI

DGI Cases by Site in ABCs, 2015 – 2017

- Demographics- 42% female, MSW 15.4%, Male 38%
- 30% >45 yrs

Year	CA	GA-DPH*	GA-MSA	Total
2015	1	--	9	10
2016	0	--	5	5
2017	1	3	7	11
Total	2	3	21	26

Site	Proportion of DGI Cases to Reported GC Cases (in Surveillance Area)
CA	2 / 29,637 (0.007%)
GA-DPH*	3 / 9,770 (0.031%)
GA-MSA	21 / 29,323 (0.072%)
Total	26 / 68,730 (0.038S)

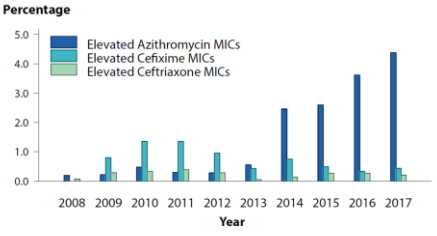
Table 1 Epidemiological, clinical, and microbiological characteristics of 21 French patients with DGI

Years	2009	2010	2011	Total
Patients (n)	2	9	10	21
Epidemiological data				
Women	0	6	3	9 (43%)
Men	2	3	7	12 (57%)
MSM	1	1	3	5 (24%)
Median age (years)	54	20	35.5	30
Paris area	2	4	4	10
Other parts of France	0	5	6	11
STI (excluding HIV)	0	5	1	6
HIV infected	0	0	2	2 (9.5%)
Clinical data				
Joints	1	7	6	14 (66%)
Knee	1	4	2	7
Elbow	1	1	0	2
Ankle	0	1	1	2
Wrist	0	0	2	2
Hand	0	0	2	2
Hip	0	1	0	1
TMJ	0	1	0	1
Skin	1	0	3	4 (19%)
Tenosynovitis	1	1	5	7 (33%)
Hands	1	0	1	2
Leg	0	1	2	3
Foot	0	0	1	1
Wrist	0	0	3	3
Endocarditis	0	1	0	1 (4%)
Genital signs	0	3	2	5 (23%)
Prostatitis	0	1	0	1 (4%)
PID	0	1	0	1 (4%)

Weston, Emerging ID

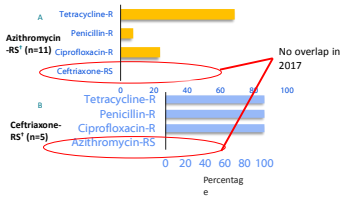
Bellacam, Sex Trans Infect 2013

***Neisseria gonorrhoeae* — Percentage of Isolates with Elevated Azithromycin Minimum Inhibitory Concentrations (MICs) (≥2.0 µg/ml), Elevated Ceftriaxone MICs (≥0.125 µg/ml), and Elevated Cefixime MICs (≥0.25 µg/ml), Gonococcal Isolate Surveillance Project (GISP), 2008–2017**



AZI 2017
MSM 7%
MSW 3%
MIC 2

Percentage of Isolates with (A) Elevated Azithromycin MICs and (B) Elevated Ceftriaxone MICs with Other Resistance Phenotypes, GISP, 2017



†Azithromycin-RS=reduced azithromycin susceptibility (MIC ≥2 µg/ml); ceftriaxone-RS=reduced ceftriaxone susceptibility (MIC ≥0.125 µg/ml)

Gonorrhea

- **United States**
  - Ceftriaxone 250 mg IM in a single dose *PLUS*
  - Azithromycin 1 g orally in a single dose
- **United Kingdom**
  - Ceftriaxone 1 gram IM in a single dose
- **Europe (European CDC)**
  - Ceftriaxone 500 mg IM in single dose PLUS
  - Azithromycin 2 gm orally in a single dose
- Japan
  - Ceftriaxone 1 gm IV/IM in a single dose

- Optimize therapeutic regimen
  - PK/PD (site of penetration)
  - Concentration dependent vs independent regimen
  - Bacterial burden
  - Mutational frequency to resistance
  - Resistance suppressive targets do not guarantee eradication
- Novel agents (Zoliflodacin, Gepotidacin)
- Treatment Failures
  - Most apparent treatment failure likely due to reinfection
  - If treatment failure suspect, obtain culture/susceptibility test + ensure partner treatment
  - Dual therapy in UK (Fifer 2016)
  - Ceftriaxone MIC of 0.5mg/L, azithromycin MIC of >256mg/L in UK, Australia (March 2018)

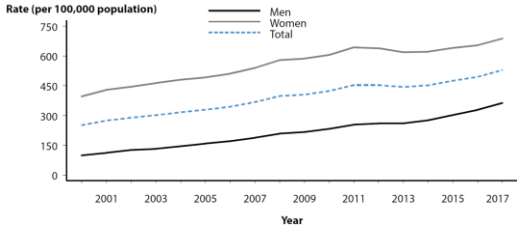
Global Antibiotic Research and Development Partnership

- Launched by WHO and Drugs for Neglected Disease Initiative in 2016
- Draft of acceptable GC target product profiles and timeline
- Research and Development plan
  - Accelerate the development of a new clinical entity
  - Evaluate the potential of existing antimicrobials and combinations
  - Explore co-packaging and fixed dose combinations
  - Development of simplified treatment guidelines

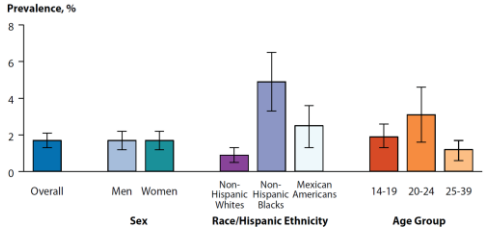
Alirol, PloS Med 2017

Chlamydia

Chlamydia — Rates of Reported Cases by Sex, United States, 2000–2017



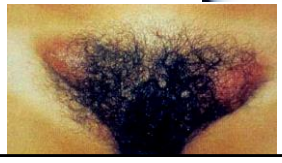
Chlamydia — National Estimates of Prevalence Among Persons Aged 14–39 Years by Sex, Race, Hispanic Ethnicity, or Age Group, National Health and Nutrition Examination Survey (NHANES), 2013–2016



Torrone E., MMWR Morb Mortal Wkly Rep 2014; 63(38):834–838.

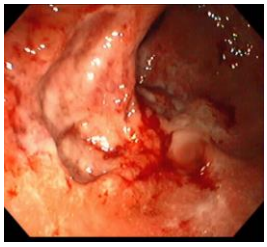
LGV inguinal syndrome

- *C.trachomatis* L1, L2, L3
- Herpetiform genital ulcers and/or papules
- Tender, fluctuant, inguinal lymphadenopathy (buboes)



LGV Proctitis

- MSM and women -+rectal chlamydia NAAT
  - PCR based genotyping
  - Protocolitis +/- perianal ulcers
  - Presumptive tx (doxy 100 mg bid x 21 d)
    - Painful perianal ulcers or mucosal ulcers presumptive therapy for HSV
  - Short course therapy 7-14 d GUM clinic in UK (Simon, STD 2018)



Notes from the Field: Cluster of Lymphogranuloma Venereum Cases Among Men Who Have Sex with Men — Michigan, August 2015–April 2016

Weekly / September 2, 2016 / 65(34);920–921

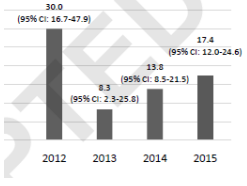
- 38 reports of LGV among MSM with HIV infection
- Median age 26 (19-60), median CD4 483 (270-1271)
- 21/38 confirmed by CDC (19 symptomatic proctitis, **2 penile ulcer**)
- Concomitant infections
  - 6/38 (16%) incident HIV
  - 4/38 (11%) hepatitis C
  - 6/38 (16%) syphilis
  - 8/38 gonorrhea (8% oral, 13% rectal)

LGV in MSM, NYC Sexual Health Clinics

Table 1. Factors associated with male anorectal lymphogranuloma venereum (LGV) infection, New York City Sexual Health Clinics, 2012-2015.

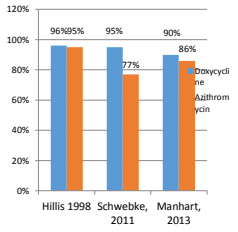
a. Patient factors.

Patient characteristic	Number anorectal chlamydia-positive patients	% LGV positive	Odds Ratio	95% CI	P
Age					
<30 years	174	10.3	1		
≥30 years	121	25.6	3.0	1.6-5.6	.0008
Race/ethnicity					
Other races/ethnicities	41	17.1	1		
Non-Hispanic black	75	24.0	1.5	0.6-4.0	0.07
Non-Hispanic white	89	12.4	0.7	0.2-1.9	0.2
Hispanic	90	14.4	0.8	0.3-2.2	0.5
HIV status					
HIV-negative/unknown status	212	9.4	1		
HIV-positive	83	34.9	5.1	2.7-9.8	<.0001
HIV-positive partner(s)					
No	179	8.3	1		
Yes	85	31.8	5.1	2.5-10.2	<.0001
Syphilis history					
No	201	10.4	1		
Yes	83	31.3	3.7	2.0-7.1	<.0001



Pathela, STD 2018

Chlamydia Treatment



- Azithromycin vs Doxycycline
  - Meta-analysis (Kong 2014)
  - Doxy > Azi 3% (urogenital)
  - Doxy > Azi 7% (sx urethral)
- Rectal Infection
  - Several retrospective studies (doxy>azi)
  - STI CTG RCT Azi vs Doxy (asx)
- LGV
  - Asx vs sx (duration of therapy)
- Reinfection is common
  - Retest in 3 mo

Human Papillomavirus

HPV Natural History

- HPV is the most common STI
  - The majority of sexually active people will become infected
- Initially most persons have no symptoms
  - Ano-genital warts, low-risk (LR) HPV rarely cause cancer
- High-risk (16, 18) HPV infection may cause anogenital and oropharyngeal cancer
  - Most high risk HPV infection clears within 2 years
  - Minority develop high-grade squamous intra-epithelial lesions
  - HSIL can progress to cervical cancer 1/80 per year

Type specific Anal HPV Prevalence, Among Men

Sexual Preference and HIV Infection Strong Independent Predictors of Male Anal HPV16

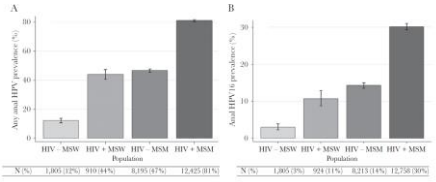
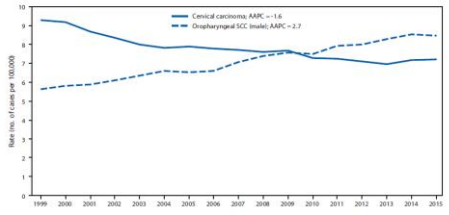


Figure 2. Prevalence of any anal human papillomavirus (HPV) infection (*A*) and anal HPV16 infection (*B*) by human immunodeficiency virus (HIV) status and sexual preference irrespective of anal diagnosis, including studies for which anal cytopathology diagnosis was unknown. Error bar: 95% CI. Abbreviations: MSM, men who have sex with men; MSW, men who have sex with women.

Marra, JID 2018

Trends in HPV Associated Cancers, US, 1999- 2015

FIGURE 1: Trends* in age-adjusted incidence of cervical carcinoma among females and oropharyngeal SCC among men,† — United States,§ 1999–2015



Oropharyngeal Cancer is the most common HPV associated cancer
Increased 2.7%/yr male and 0.8%/yr female

Anal Cancer
Increased 2.1%/yr male and 2.9%/yr female

MMWR, Van Dyne 2018

Recommendations for Cervical Cancer Screening for Women with HIV

Women with HIV Aged <30 Years

- If younger than age 21, known to have HIV or been newly diagnosed with HIV, and sexually active, screen within 1 year of onset of sexual activity regardless of mode of HIV infection.
- Women with HIV aged 21–29 should have a Pap test following initial diagnosis.
- Pap test should be done at baseline and every 12 months **(BII)**.
- Some experts recommend a Pap test at 6 months after the baseline test **(CIII)**.
- If results of 3 consecutive Pap tests are normal, follow-up Pap tests can be performed every 3 years **(BII)**.
- Co-testing (Pap test and HPV test) is not recommended for women younger than 30.

Women with HIV Aged ≥30 Years

Pap Testing Only:

- Pap test should be done at baseline and every 12 months **(BII)**.
- Some experts recommend a Pap test at 6 months after the baseline test **(CIII)**.
- If results of 3 consecutive Pap tests are normal, follow-up Pap tests can be performed every 3 years **(BII)**.

Or

Pap Test and HPV Co-Testing:

- Pap test and HPV co-testing should be done at baseline **(BII)**.
- If result of the Pap test is normal and HPV co-testing is negative, follow-up Pap test and HPV co-testing can be performed every 3 years **(BII)**.
- If the result of the Pap test is normal but HPV co-testing is positive:

Either

- Follow-up test with Pap test and HPV co-testing should be performed in 1 year.
- If the 1-year follow-up Pap test is abnormal or HPV co-testing is positive, referral to colposcopy is recommended.

Or

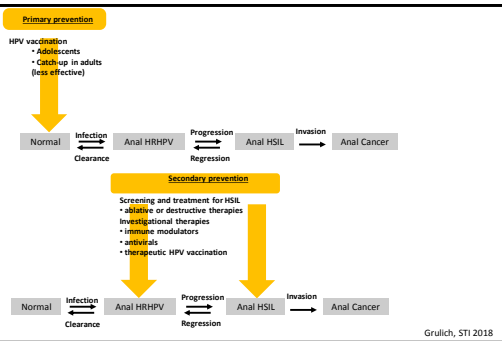
- Perform HPV genotyping.
  - If positive for HPV16 or HPV18, colposcopy is recommended.
  - If negative for HPV16 and HPV18, repeat co-test in 1 year is recommended. If the follow-up HPV test is positive or Pap test is abnormal, colposcopy is recommended.

Or

Pap Test and HPV16 or HPV16/18 Specified in Co-Testing:

- Pap test and HPV16 or 16/18 co-testing should be done at baseline **(BII)**.
- If result of the Pap test is normal and HPV16 or 16/18 co-testing is negative, follow-up Pap test and HPV co-testing can be performed every 3 years **(BII)**.
- If initial test or follow up test is positive for HPV16 or 16/18, referral to colposcopy is recommended **(BII)**.

HIV OI Guidelines

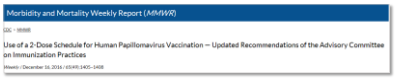


Grulich, STI 2018

HPV Vaccine

Nanovalent HPV Vaccine

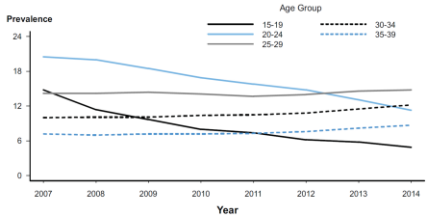
- Types 6, 11, 16, 18, 31, 33, 45, 52, 58
- FDA approved to prevent warts, cervical, vulvar, vaginal and anal cancer


Morbidity and Mortality Weekly Report (*MMWR*)

Use of a 2-Dose Schedule for Human Papillomavirus Vaccination — Updated Recommendations of the Advisory Committee on Immunization Practices

- 2 doses for males/females aged 9-14
- 3 doses for males/females aged 15-26
- Immunocompromised patients need 3 doses, regardless of age of initiation

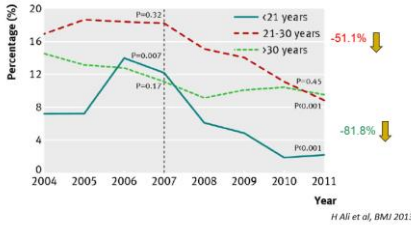
Cervical Intraepithelial Neoplasia Grades 2 and 3 — Prevalence per 1000 Person-Years Among Female Enrollees in Private Health Plans Aged 15–39 Years, by Age Group and Year, 2007–2014



Flagg EW, Am J Public Health 2016; 106(12):2211–2218.

Vaccinating females leads to substantial herd protection from HPV in *heterosexual* men

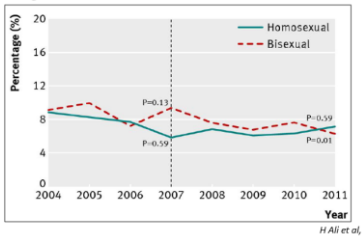
Proportion of Australian-born heterosexual men attending sexual health clinics with genital warts by age group, 2004-2011



H Ali et al, BMJ 2013

HPV Vaccination in Gay, Bisexual Men

Proportion of Australian-born GBM attending sexual health clinics with anogenital warts, 2004-11



H Ali et al, BMJ 2013

HPV Vaccination, Gay and Bisexual Men, 18-26yo

Table 2. Vaccine Efficacy against HPV-6, 11, 16, or 18–Related Anal Intraepithelial Neoplasia (AIN) and Anal Cancer in the Per-Protocol Efficacy Population.[a]

End Point	qHPV Vaccine (N=299)				Placebo (N=299)				Observed Efficacy (95% CI)[†]
	No. Included in Analysis	No. of Affected Participants	Person-Yr at Risk	Events per 100 Person-Yr at Risk	No. Included in Analysis	No. of Affected Participants	Person-Yr at Risk	Events per 100 Person-Yr at Risk	
									percent
By lesion type									
AIN grade 1	194	4	383.1	1.0	208	16	413.8	3.9	73.0 (16.3 to 93.4)
Condyloma acuminatum	194	0	386.8	0.0	208	6	418.2	1.4	100 (8.2 to 100)
Flat lesion	194	4	383.1	1.0	208	11	416.7	2.6	60.4 (−33.5 to 90.8)
AIN grade 2 or 3	194	3	383.9	0.8	208	13	417.2	3.1	74.9 (8.8 to 95.4)

[a] The per-protocol efficacy population consisted of participants who were seronegative and had HPV DNA–negative swab and biopsy specimens on day 1 for relevant vaccine types, were negative for vaccine-type DNA through month 7, and did not have any protocol violations. To eliminate

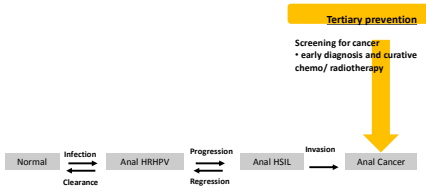
J Palefsky et al, NEJM 2011

HPV Vaccination in HIV+ Adults >27 yrs

Table 2. Vaccine Efficacy for Persistent Anal Infection, Persistent Oral Infection, Anal High-Grade Squamous Intraepithelial Lesions on Anal Biopsy, and Abnormal Anal Cytology

Endpoint	Vaccine Group		Control Group		Efficacy (95.1% Confidence Interval)
Persistent anal infection	n	Endpoint	n	Endpoint	
mITTincluding single detection at final visit	286	27	283	33	22% (−31% to 53%)
mITTpersistent infection only	286	14	283	17	21% (−61% to 61%)
Per protocol analysis	276	7	277	10	31% (−82% to 74%)
Full ITT	288	28	286	41	35% (−5% to 60%)
Persistent oral infection					
mITTincluding single detection at final visit	288	7	286	10	32% (−80% to 74%)
mITTpersistent infection only	288	1	286	8	88% (2% to 98%)
Per-protocol analysis	278	1	280	3	66% (−70% to 96%)
Full ITT	288	6	286	14	58% (−9% to 84%)
Improvement of anal high-grade squamous intraepithelial lesions on anal biopsy outcomes[a]					
Full ITT	288	46	286	45	0% (−44% to 31%)
Abnormal anal cytology					
Week 52	231	123 (53%)	229	121 (53%)	0% (−19% to 16%)
Week 104	199	98 (49%)	198	108 (55%)	9% (−10% to 25%)
Week 156	130	58 (45%)	132	72 (55%)	17% (−6% to 35%)

Wilkin, CID 2018



Does Treating HSIL Prevent Anal Cancer?

-**Anchor Study**

Assessment of anal HSIL treatment in reducing anal cancer in HIV+ men/ women vs active monitoring- digital anorectal exam

Ablative therapies -infrared coagulation, electrocautery, and TCA

Estimated recruitment > 5000, 5 year follow up

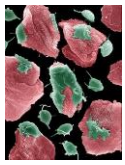
Patients randomly assigned to treatment or active monitoring arms

Estimated completion mid 2022

ClinicalTrials.gov NCT02135419

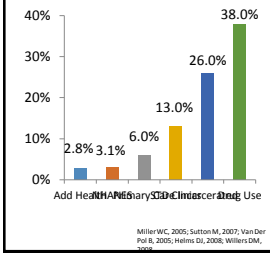
Trichomonas

Trichomonas vaginalis

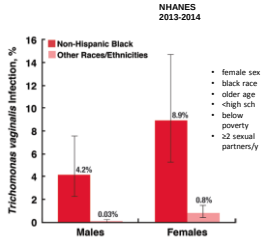


- Single-celled protozoan parasite
- Adheres to epithelial cells
  - Male or female urethra
  - Female vagina, vulva
- Causes local inflammation
- Variable spectrum of disease
  - 70–85% of women and 77% of men are asymptomatic
  - Vaginitis, urethritis, prostatitis
  - Associated with increased susceptibility to other STIs (HIV), adverse pregnancy outcomes, low birth weight

T. vaginalis Epidemiology



Miller WC, 2005; Sutton M, 2007; Van Der Pol B, 2005; Helms DJ, 2008; Willers DM, 2008



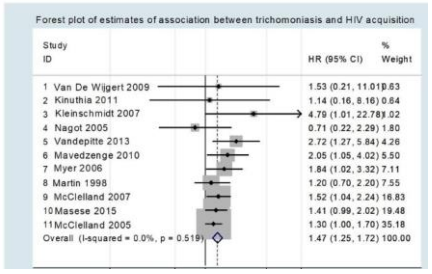
Patel, CID 2018

Table 3. Comparative Prevalence of Sexually Transmitted Infections in the Civilian, Noninstitutionalized US Population Aged 18–39 Years

Infection	Prevalence, % (95% CI)			Crude PR (95% CI)	Adjusted PR (95% CI)[a]	Adjusted PR (95% CI)[b]
	Overall	Non-Hispanic Black	Other Races/Ethnicities			
Males and females						
TV infection	1.2 (.6–2.1)	7.0 (4.4–11.1)	0.3 (.1–1.0)[c]	**23.7 (7.2–78.1)**	**16.8 (5.4–52.7)**	**10.6 (2.9–38.7)**
CT infection	2.0 (1.3–3.0)	5.4 (3.7–7.9)	1.5 (.8–2.8)	**3.6 (1.6–8.0)**	**2.6 (1.1–6.3)**	2.1 (.8–5.4)
HSV-2 serostatus	10.7 (8.8–13.1)	31.3 (26.9–36.2)	8.0 (6.2–10.2)	**3.9 (3.0–5.2)**	**3.8 (2.8–5.1)**	**3.8 (2.7–5.4)**
Genital HPV infection	43.6 (39.0–48.2)	67.2 (60.3–73.5)	40.1 (35.4–45.0)	**1.7 (1.4–2.0)**	**1.7 (1.4–2.0)**	**1.5 (1.3–1.7)**
Males						
TV infection	0.3 (.1–.9)[c]	2.7 (.9–7.9)[c]	0.0[d]	…	…	…
CT infection	1.8 (1.1–3.0)	5.4 (3.2–8.9)	1.3 (.6–2.9)[e]	**4.0 (1.5–10.6)**	**3.8 (1.3–10.8)**	2.3 (.6–8.6)
HSV-2 serostatus	7.2 (5.5–9.3)	20.9 (15.4–27.8)	5.5 (3.9–7.8)	**3.8 (2.4–5.8)**	**3.9 (2.6–5.9)**	**3.5 (2.0–6.0)**
Penile HPV infection	42.3 (37.5–47.2)	69.5 (61.1–76.7)	38.6 (33.4–44.0)	**1.8 (1.5–2.2)**	**1.8 (1.6–2.1)**	**1.6 (1.3–1.9)**
Females						
TV infection	2.0 (1.1–3.5)	10.5 (6.8–16.0)	0.6 (.2–2.0)[c]	**17.6 (4.6–67.1)**	**14.0 (3.9–50.2)**	**8.3 (1.9–35.4)**
CT infection	2.2 (1.4–3.4)	5.4 (3.2–9.1)	1.7 (.9–3.1)	**3.2 (1.4–7.4)**	2.0 (.9–4.4)	1.8 (.9–3.6)
HSV-2 serostatus	14.3 (11.1–18.1)	39.8 (34.9–45.0)	10.5 (7.7–14.2)	**3.8 (2.7–5.4)**	**3.7 (2.7–5.2)**	**4.0 (2.8–5.7)**
Vaginal HPV infection	44.8 (39.6–50.1)	65.3 (57.0–72.7)	41.6 (36.4–47.0)	**1.6 (1.3–1.9)**	**1.5 (1.2–1.8)**	**1.4 (1.2–1.7)**

Patel, CID 2018

Trichomonas vaginalis and HIV acquistion



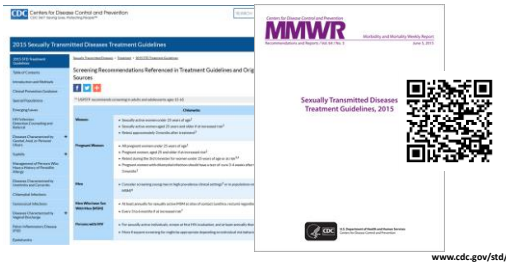
TV increased risk of HIV 1.5X

Masha, STI 2018

Trichomonas

- Screen at initial visit HIV+ (NAAT)
- Rx: Metronidazole HIV+ 500 mg bid x 7 days (Kissinger, 1999)
- Options to Nitroimidazoles
  - Single agent vs Combination therapy
  - Intravaginal- paromomycin, boric acid
  - Secnidazole
- Clinical treatment failure
  - Re-infection, Nonadherence
  - Antimicrobial resistance
- Retesting 3 months after treatment
- Management of persistent infection
  - Up to 17% at 3 months
  - Reinfection from untreated partner is common
  - Infection with MTZ-resistant strain: ~4-10%
    - Tinidazole-resistant ~1%
    - No clear relationship to clinical treatment failure
  - Susceptibility testing if resistance suspected (CDC)

STI Screening and Management



www.cdc.gov/std/tg2015

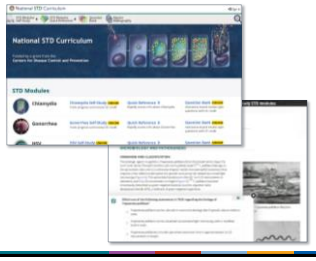
National Network of STD Clinical Prevention Training Centers (NNPTC)

- **Clinical Training and Consultation Network**
  - Visit: www.STDCCN.org.
- **Resources and tools for STD treatment**
- **STD Clinical Toolbox App**
- **Visit: www.nnptc.org**

National Network of STD Clinical Prevention Training Centers (NNPTC)

National STD Curriculum

- www.std.uw.edu
- Self-Study Modules
- Modular learning
- Free continuing education credits (CME and CNE)



Question-and-Answer

Sexually Transmitted Infections: Gonorrhea, Chlamydia, Trichomoniasis, and Human Papillomavirus
Kimberly A. Workowski, MD

SUGGESTED READINGS

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