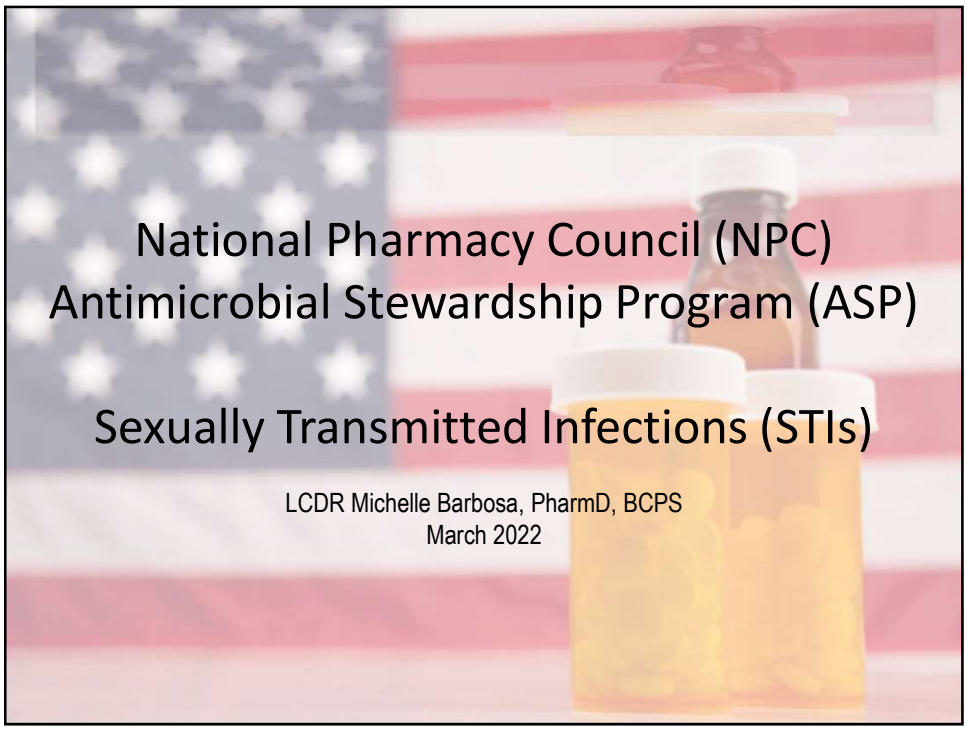

National Pharmacy Council (NPC) Antimicrobial Stewardship Program (ASP)

Sexually Transmitted Infections (STIs)

LCDR Michelle Barbosa, PharmD, BCPS
March 2022

Presenter Disclosure Information

Financial Disclosure: I do not have a financial relationships with any commercial entity which may represent, in perception or reality, a conflict of interest in the context of this presentation.

The views expressed in this presentation reflect those of the author, and not necessarily those of the Public Health Service.

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Learning Objectives

- Recognize clinical signs and prevalence of common sexually transmitted infections (STIs).
- Examine the current 2021 STD guideline recommendations for treatment of STIs.
- Incorporate effective prevention strategies at local sites.

3

Review Questions

- What are three avenues for STD prevention?
- What is the minimum time you should wait to retest after a positive chlamydia infection?
- What is the treatment of choice for gonorrheal infections?

4

Outline

- Sexually Transmitted Infections
  - Overview
  - Prevalence
  - Prevention
  - Infections
    - Cause
    - Prevalence
    - Signs and symptoms
    - Treatment
  - Special Populations

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Prevalence

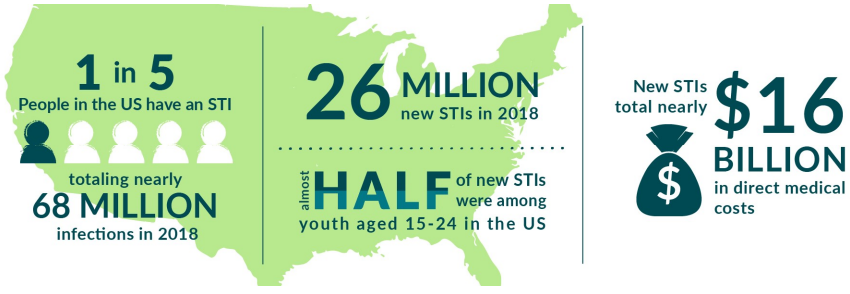
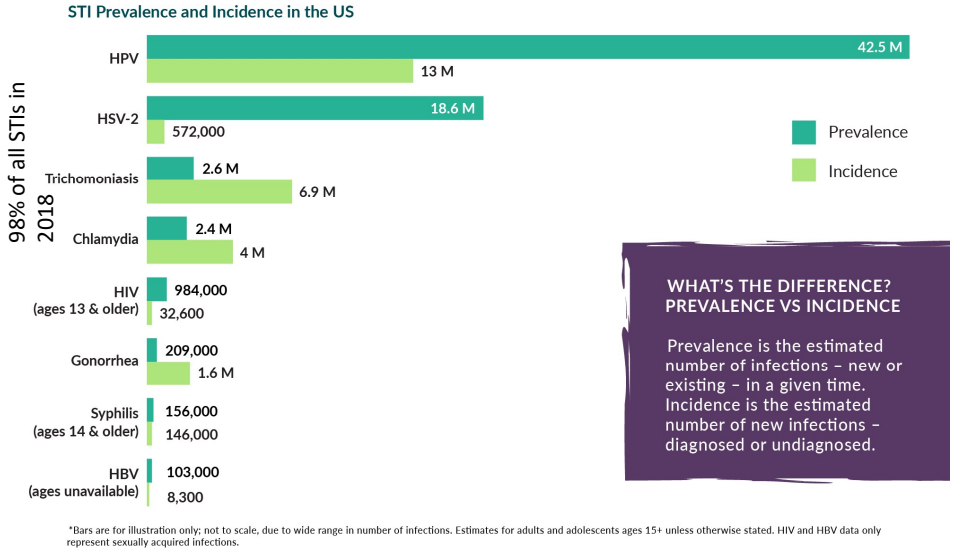


image and data from the CDC:https://www.cdc.gov/std/statistics/prevalence-2020-at-a-glance.htm

6

Prevalence



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Prevalence

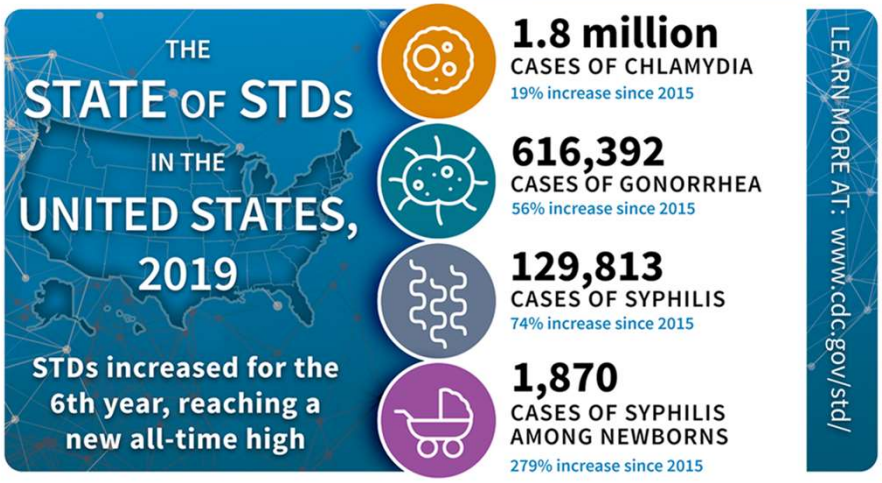
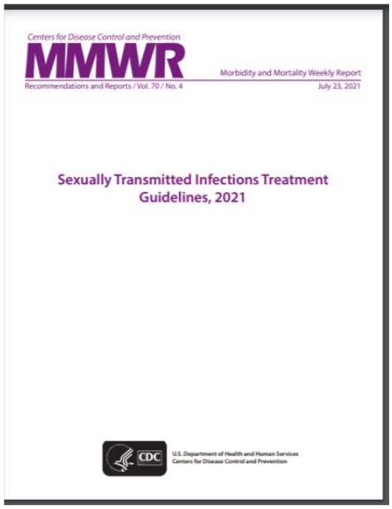


image and data from the CDC: https://www.cdc.gov/std/stats18/infographic.htm

8

Treatment Guidelines



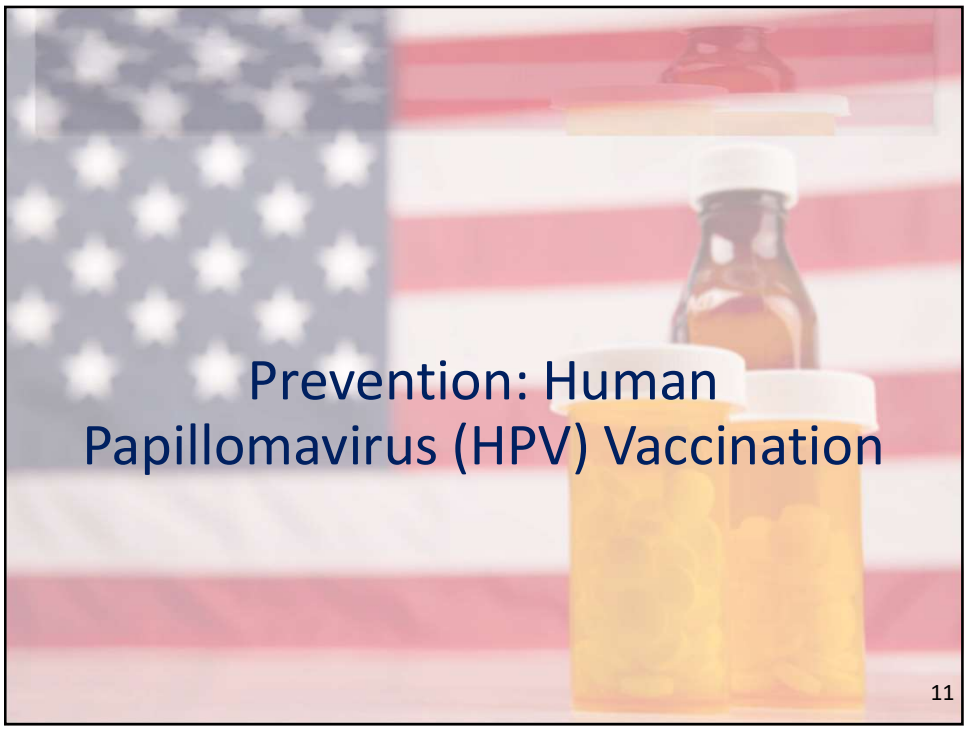
https://www.cdc.gov/std/treatment-guidelines/STI-Guidelines-2021.pdf

9

Prevention

- Risk assessment & education
  - Limit sexual partners
  - Abstinence
  - Barrier precautions
- Pre-exposure vaccinations
  - HPV
  - HepB
- Identify and treat

10



Prevention: Human Papillomavirus (HPV) Vaccination

- HPV Vaccine
  - 2-3 dose series
- ACIP Recommendation
  - Routine vaccine age 11-12
    - May start as young as 9
  - All people aged 13-26 not previously vaccinated
  - Shared decision making for 27-45
- Products Available
  - Gardasil 9 (9vHPV, Merck)

https://www.cdc.gov/std/treatment-guidelines/STI-Guidelines-2021.pdf & https://www.immunize.org/askexperts/experts_hpv.asp

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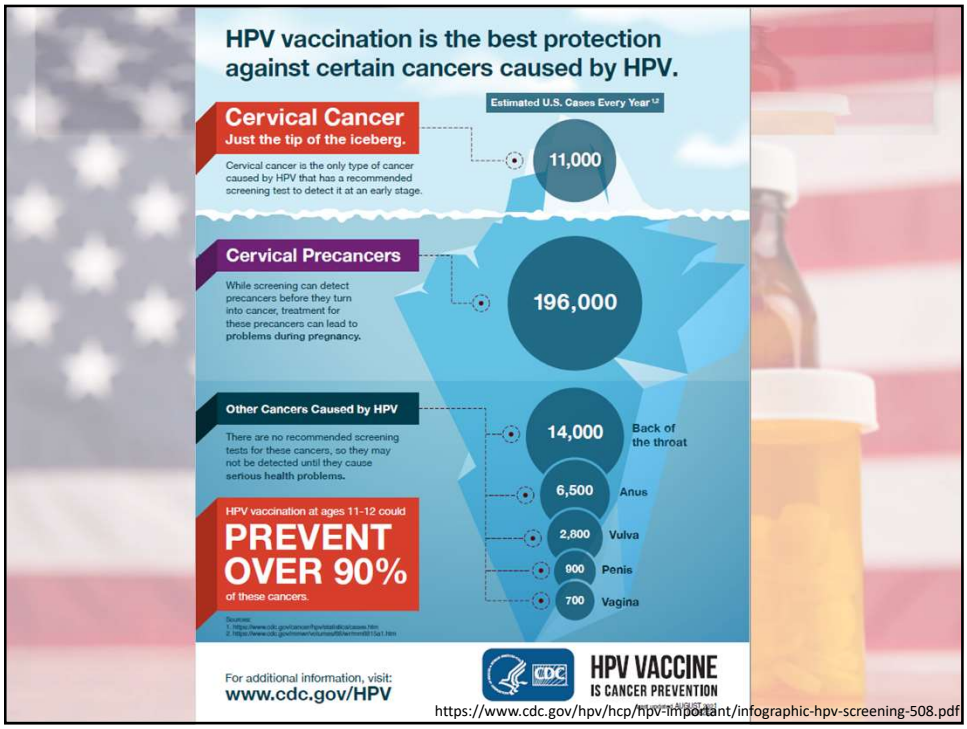

https://www.cdc.gov/hpv/hcp/hpv-important/infographic-hpv-screening-508.pdf

Prevention: Human Papillomavirus (HPV) Vaccination

> J Infect Dis. 2013 Aug 1;208(3):385-93. doi: 10.1093/infdis/jit192. Epub 2013 Jun 19.

Reduction in human papillomavirus (HPV) prevalence among young women following HPV vaccine introduction in the United States, National Health and Nutrition Examination Surveys, 2003–2010

Lauri E Markowitz [1], Susan Hariri, Carol Lin, Eileen F Dunne, Martin Steinau, Geraldine McQuillan, Elizabeth R Unger

- Compared ~4000 swabs from 2003-2006 with 2007-2010
- HPV strains covered by HPV vaccine reviewed
- Prevalence decreased from 11.5% to 5.1%

https://pubmed.ncbi.nlm.nih.gov/23785124/

14

Prevention: Human Papillomavirus (HPV) Vaccination

J Infect Dis. 2017 Sep 1;216(5):594-603. doi: 10.1093/infdis/jix244.

Prevalence of Human Papillomavirus Among Females After Vaccine Introduction-National Health and Nutrition Examination Survey, United States, 2003-2014

Sara E Oliver [1], Elizabeth R Unger [2], Rayleen Lewis [1], Darius McDaniel [1], Julia W Gargano [1], Martin Steinau [2], Lauri E Markowitz [1]

Affiliations + expand

PMID: 28931217 PMCID: PMC5740482 DOI: 10.1093/infdis/jix244

- Compared 2003-2006, 2007-2010, and then 2011-2014 data
- ~2000 samples in each year
- Concluded 89% decrease in those vaccinated and 34% reduction in unvaccinated

https://pubmed.ncbi.nlm.nih.gov/28931217/

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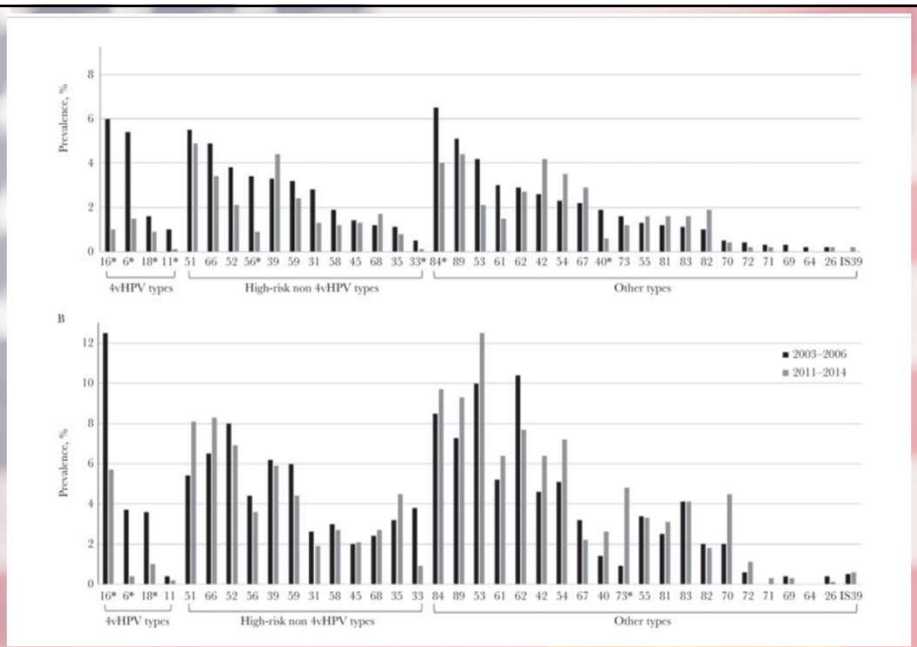

Oliver SE, Unger ER, Lewis R, McDaniel D, Gargano JW, Steinau M, Markowitz LE. Prevalence of Human Papillomavirus Among Females After Vaccine Introduction-National Health and Nutrition Examination Survey, United States, 2003-2014. J Infect Dis. 2017 Sep 1;216(5):594-603. doi: 10.1093/infdis/jix244. PMID: 28931217; PMCID: PMC5740482.
https://pubmed.ncbi.nlm.nih.gov/28931217/

HPV Vaccination Rates

TABLE 1. Estimated vaccination coverage with selected vaccines and doses among adolescents aged 13–17* years, by age at interview — National Immunization Survey–Teen, United States, 2020

	Age at interview (yrs), % (95% CI)†					Total, % (95% CI)†	
	13	14	15	16	17	2020	2019
Vaccine	(n = 4,276)	(n = 4,173)	(n = 3,998)	(n = 4,028)	(n = 3,688)	(N = 20,163)	(N = 18,788)
HPV§§ vaccine							
All adolescents							
≥1 dose	69.4 (66.6–72.1)	72.3 (69.4–75.0)	77.6 (75.3–79.8)**	77.2 (74.7–79.6)**	79.0 (76.4–81.4)**	75.1 (73.9–76.2)¶¶	71.5 (70.1–72.8)
HPV UTD***	45.6 (42.7–48.5)	56.0 (53.0–58.9)**	61.9 (58.9–64.7)**	65.5 (62.6–68.2)**	64.5 (61.5–67.4)**	58.6 (57.3–60.0)¶¶	54.2 (52.7–55.8)
Females							
≥1 dose	71.3 (67.7–74.7)	72.9 (68.4–77.0)	78.1 (74.6–81.3)**	80.3 (76.3–83.8)**	83.5 (80.8–85.9)**	77.1 (75.4–78.7)¶¶	73.2 (71.3–75.0)
HPV UTD	48.4 (44.3–52.5)	57.2 (52.6–61.7)**	63.7 (59.4–67.8)**	68.5 (64.0–72.6)**	70.4 (66.6–73.9)**	61.4 (59.5–63.3)¶¶	56.8 (54.6–59.0)
Males							
≥1 dose	67.5 (63.2–71.5)	71.7 (67.9–75.2)	77.1 (73.9–80.1)**	74.5 (71.1–77.6)**	74.8 (70.4–78.6)**	73.1 (71.5–74.8)¶¶	69.8 (67.9–71.7)
HPV UTD	42.7 (38.6–46.9)	54.8 (50.9–58.6)**	60.0 (56.1–63.9)**	62.8 (58.9–66.4)**	59.0 (54.4–63.5)**	56.0 (54.1–57.8)¶¶	51.8 (49.7–53.9)

https://www.cdc.gov/mmwr/volumes/70/wr/mm7035a1.htm?s_cid=mm7035a1_w#T1_down 17

Prevention: Hepatitis B Vaccination

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Current ACIP Recommendations

- Heplisav-B (HepB-CpG) administered as a 2-dose series
  - Persons ≥ 18yo: 0 and 1 month
- Traditional 3 dose series HepB (Recombivax-B, Engerix-B)
  - Children (1-18yo): 0.5 mL at 0, 1, and 6 months
  - Adults 19+: 0, 1 and 6 months, minimum interval 0, 1, 4 months
  - Dialysis Dosing
    - Unique dosing based on brand
- Since 1994, HepB has been recommended as a routine vaccination

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Current ACIP Recommendations

ACIP approved the following recommendations by majority vote at its November 3, 2021 meeting: The ACIP recommends the following groups should receive hepatitis B vaccines: **Adults 19 through 59 years of age**. **Adults 60 years of age and older with risk factors for hepatitis B infection**.

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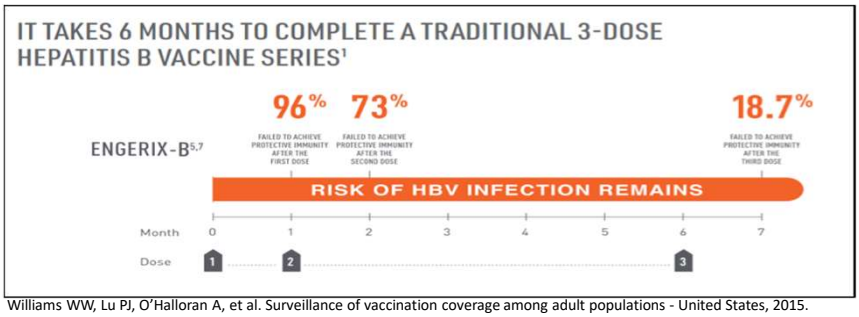
Dosing Intervals

- Traditional 3-dose are difficult to complete
  - ~40% of HCPs did NOT receive all 3 doses
  - ~75% of adults 19+ did NOT receive all 3 doses
- Failed immunity after series completion
  - ~20-30% fail to achieve immunity
  - ~35% of diabetics fail to achieve immunity



Williams WW, Lu PJ, O'Halloran A, et al. Surveillance of vaccination coverage among adult populations - United States, 2015. *MMWR Surveill Summ.* 2017;66(11):1-28._
_Schillie S, Murphy TV, Sawyer M, et al. CDC guidance for evaluating health-care personnel for hepatitis B virus protection and for administering postexposure management. *MMWR Recomm Rep.* 2013;62(RR-10):1-19.
21

HEPLISAV-B® VACCINE (HEPB-CPG)

- Heplisav-B
  - 0.5ml dose given IM
  - 2-dose series
    - 0 then 1 month later
  - Yeast derived Hep B surface antigen prepared with novel adjuvant

Kim DK, Hunter P; for the Advisory Committee on Immunization Practices. Recommended adult immunization schedule, United States, 2019. *Ann Intern Med.* 2019;170(3):182-192. **2.** Schillie S, Harris A, Link-Gelles R, Romero J, Ward J, Nelson N. Recommendations of the Advisory Committee on Immunization Practices for use of a hepatitis B vaccine with a novel adjuvant. *MMWR Morb Mortal Wkly Rep.* 2018;67(15):455-458.
22

Study 1

Category	Safety of a two dose investigational hepatitis B vaccine, HepB CpG, using a toll like receptor 9 agonist adjuvant in adults
Population	Adult patients
Intervention	HBsAg-1018
Comparators	HBsAg-Eng
Outcomes	Safety profile and immunologic response
Timing	Followed for 28, 52, and 56 weeks after the first injection
Study design	Randomized, observer-blinded, active controlled, parallel-group, and multicenter

Hyer R, McGuire DK, Xing B, Jackson S, Janssen R. Safety of a two-dose investigational hepatitis B vaccine, HBsAg-1018, using a toll-like receptor 9 agonist adjuvant in adults. Vaccine. 2018 May 3;36(19):2604-2611. doi: 10.1016/j.vaccine.2018.03.067. Epub 2018 Apr 5. PMID: 29628151.

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Table 3
Overview of solicited post-injection reactions after all active injections and unsolicited adverse events and medically-attended adverse events.

Type of event (Study)	HBsAg-1018	HBsAg-Eng
Post-injection reactions (HBV-10 and HBV-16), N	3762	1084
Any PIR,% (n)	55.1 (2071)	57.1 (619)
Local PIRs,% (n)	42.8 (1612)	41.1 (445)
Systemic PIRs,% (n)	32.3 (1215)	37.4 (405)
AEs (HBV-10 and HBV-16), N	3778	1086
Any AE,% (n)	55.3 (2089)	58.1 (631)
Discontinuation of treatment due to AE,% (n)	0.5 (19)	0.4 (4)
Related,% (n)	6.2 (234)	6.0 (65)
MAEs (HBV-23), N	5587	2781
Any MAE,% (n)	46.0 (2569)	46.2 (1286)
Discontinuation of treatment due to MAE,% (n)	0.6 (32)	0.5 (15)
Related,% (n)	1.0 (58)	1.6 (45)
Safety population (HBV-10, HBV-16, HBV-23)	9365	3867
New-onset immune-mediated AESIs	0.17 (16)	0.13 (5)
Bell's palsy,% (n)	0.06 (6)	0.05 (2)
AESI excluding Bell's palsy,% (n)	0.11 (10)	0.08 (3)
Death,% (n)	0.28 (26)	0.21 (8)
Serious AE,% (n)	4.8 (449)	4.8 (184)
Related,% (n)	0.04 (4)	0.1 (5)

AE = adverse event; AESI = adverse event of special interest; MAE = medically-attended adverse event; N = number of participants in the safety analysis population in the treatment group; n = number of participants with an event; PIR = post-injection reaction; SAE = serious adverse event. Note: relatedness was determined by investigators.

Hyer R, McGuire DK, Xing B, Jackson S, Janssen R. Safety of a two-dose investigational hepatitis B vaccine, HBsAg-1018, using a toll-like receptor 9 agonist adjuvant in adults. Vaccine. 2018 May 3;36(19):2604-2611. doi: 10.1016/j.vaccine.2018.03.067. Epub 2018 Apr 5. PMID: 29628151.

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Study 2

Category	Immunogenicity of a two dose investigational hepatitis B vaccine, HepB-CpG, using a toll like receptor 9 agonist adjuvant compared with licensed hepatitis B vaccine in adults
Population	Adult patients (18-70 years old)
Intervention	HBsAg-1018
Comparators	HBsAg-Eng
Outcomes	Primary: Immunogenicity
Timing	56 weeks after the first injection
Study design	Randomized, observer-blinded, active controlled, parallel-group, and multicenter

J.M. Janssen, S. Jackson, W.L. Heyward, R.S. Janssen. **Immunogenicity of an investigational hepatitis B vaccine with a Toll-like receptor 9 agonist adjuvant (HBsAg-1018) compared with a licensed hepatitis B vaccine in subpopulations of healthy adults 18–70 years of age.** Vaccine, 33 (2015), pp. 3614-36

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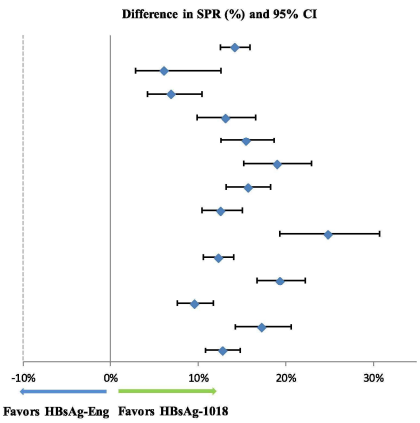
Population	HBsAg-1018 (2 Doses)		HBsAg-Eng (3 Doses)		Difference in SPR (95% CI)
	N	SPR (%)	N	SPR (%)	
All Subjects	4376	95.40%	2289	81.30%	14.20% (12.5%-15.9%)
18—29 years	174	100.00%	99	93.90%	6.10% (2.8%-12.6%)
30—39 years	632	98.90%	326	92.00%	6.90% (4.2%-10.4%)
40—49 years	974	97.20%	518	84.20%	13.10% (9.9%-16.6%)
50—59 years	1439	95.20%	758	79.70%	15.50% (12.6%-18.7%)
60—70 years	1157	91.60%	588	72.60%	19.00% (15.2%-23.0%)
Men	2203	94.50%	1150	78.80%	15.70% (13.2%-18.3%)
Women	2173	96.40%	1139	83.80%	12.60% (10.4%-15.0%)
Diabetes[a]	640	90.00%	321	65.10%	24.90% (19.3%-30.7%)
No diabetes	3762	96.20%	1968	83.90%	12.30% (10.6%-14.1%)
Obese[b]	2165	94.70%	1076	75.40%	19.40% (16.7%-22.2%)
Non-obese	2208	96.10%	1212	86.60%	9.60% (7.6%-11.7%)
Smoker	1371	95.90%	711	78.60%	17.30% (14.2%-20.6%)
Non-smoker	3005	95.20%	1578	82.40%	12.80% (10.8%-14.8%)



[a] Comparison is the SPR at week 28 for both HBsAg-1018 and HBsAg-Eng groups.

[b] Data for 3 participants with unknown BMI are not shown. Obese is BMI ≥ 30 kg/m^2.

Note: All comparisons $p < 0.0000001$.

J.M. Janssen, S. Jackson, W.L. Heyward, R.S. Janssen. **Immunogenicity of an investigational hepatitis B vaccine with a Toll-like receptor 9 agonist adjuvant (HBsAg-1018) compared with a licensed hepatitis B vaccine in subpopulations of healthy adults 18–70 years of age.** Vaccine, 33 (2015), pp. 3614-36

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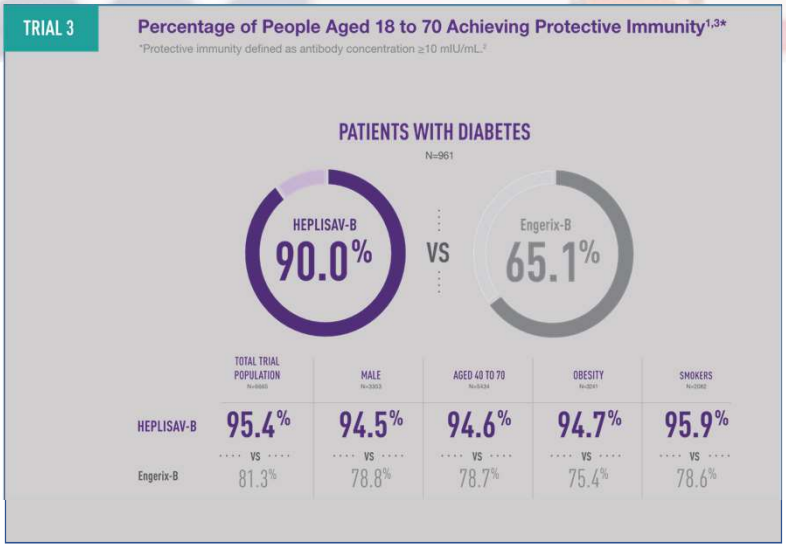

J.M. Janssen, S. Jackson, W.L. Heyward, R.S. Janssen. **Immunogenicity of an investigational hepatitis B vaccine with a Toll-like receptor 9 agonist adjuvant (HBsAg-1018) compared with a licensed hepatitis B vaccine in subpopulations of healthy adults 18–70 years of age.** Vaccine, 33 (2015), pp. 3614-36

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Study 3

Category	**I**mmunogenicity and safety of a n investigational hepatitis B vaccine with a Toll like receptor 9 agonist adjuvant (HBsAG 1018) compared to a licensed hepatitis B vaccine in healthy adults 40 70 years of age.
Population	Adult patients (40-70 years old)
Intervention	HBsAg-1018
Comparators	HBsAg-Eng
Outcomes	Primary: Immunogenicity
Timing	52 weeks after the first injection
Study design	Randomized, observer-blinded, active controlled, and multicenter

Heyward WL, Kyle M, Blumenau J, Davis M, Reisinger K, Kabongo ML, Bennett S, Janssen RS, Namini H, Martin JT. Immunogenicity and safety of an investigational hepatitis B vaccine with a Toll-like receptor 9 agonist adjuvant (HBsAg-1018) compared to a licensed hepatitis B vaccine in healthy adults 40-70 years of age. Vaccine. 2013 Nov 4;31(46):5300-5. doi: 10.1016/j.vaccine.2013.05.068. Epub 2013 May 30. PMID: 23727002.

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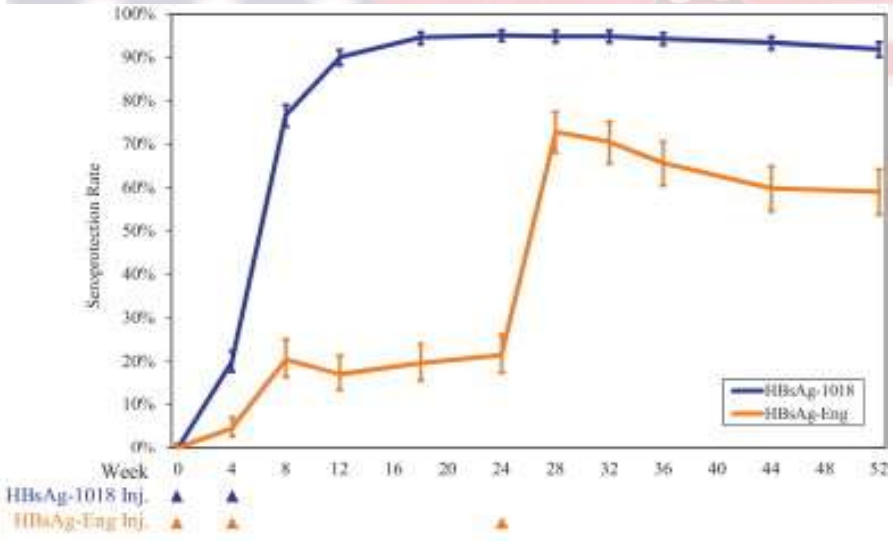

Heyward WL, Kyle M, Blumenau J, Davis M, Reisinger K, Kabongo ML, Bennett S, Janssen RS, Namini H, Martin JT. Immunogenicity and safety of an investigational hepatitis B vaccine with a Toll-like receptor 9 agonist adjuvant (HBsAg-1018) compared to a licensed hepatitis B vaccine in healthy adults 40-70 years of age. Vaccine. 2013 Nov 4;31(46):5300-5. doi: 10.1016/j.vaccine.2013.05.068. Epub 2013 May 30. PMID: 23727002.

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Prevention: Vaccinations

- Prevention is important including vaccines
- Pharmacist are uniquely situated to be advocates
- Pharmacy Immunization services should expand in both the inpatient and outpatient arenas

Immunology/Immunizations

IMMUNIZATIONS	IMMUNOLOGY
HIB (PedVaxHIB) >INFO: Asplenic and Bone Marrow Transplant Patients	cycloSPORIN (NEORAL) Caps (R)
Hepatitis A (Adult) Vaccine (19 and Older)	Mycophenolate 1000mg PO bid
Hepatitis B (Heplisav) 20mcg Vaccine	TACROlimus CAPS (R)
Human Papillomavirus (HPV 9) Vaccine	PPD (Tuberculin) Skin Test: Place and Read
Pneumococcal (Prevnar PCV 20) Vaccine	
Td (Tetanus & Diphtheria Toxoids) Vaccine IM	2021 TO 2022 INFLUENZA IMM PREP
Tdap (Adacel) Vaccine	Influenza Vaccine (Adult) IM Fluad (65+ ONLY) Influenza Vaccine IM
MCV 4 (Menactra) MEN B (Bexsero) >INFO: Special Populations: Asplenic or to Complete Series	
> LIVE VACCINES * NEED MD ORDER MMR Vaccine	COVID 19 VACCINATIONS >INFO: Give at discharge ONLY Must provide EUA fact sheet
Varicella (Chickenpox) Vaccine SQ *LIVE*	Covid 19 (Pfizer) Vaccine
Zoster Vaccine (age > 60) *LIVE*	Covid 19 (Janssen) Vaccine (R): Restricted

Prevention

Image from cdc.gov

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STIs

- Chlamydia
- Gonorrhea
- Trichomonas
- Syphilis
- Genital Herpes

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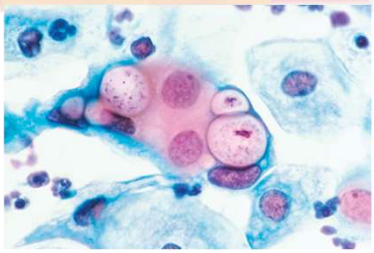
Chlamydia



- Cause
  - *Chlamydia trachomatis*
- Prevalence
- Signs and symptoms
- Complications
  - PID
  - Perihepatitis(Fitz-Hugh-Curtis syndrome)
  - Reactive arthritis (reactive arthritis triad RAT)
  - Chlamydial conjunctivitis

image from:
https://www.britannica.com/science/Chlamydia-microorganism

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Chlamydia

- Treatment
  - Doxycycline 100 mg orally 2 times daily x 7 days

    OR
  - Doxycycline 200 mg DR orally 1 time daily x 7 days

- Alternative Treatments
  - Azithromycin 1 g orally x 1*
    - Levofloxacin 500 mg orally 1 time a day x 7 days

*first line treatment in pregnancy

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Gonorrhea

- Cause
  - *Neisseria gonorrhoeae*
- Prevalence
- Signs and symptoms
- Complications
  - PID
  - Disseminated gonococcal infection (DGI)

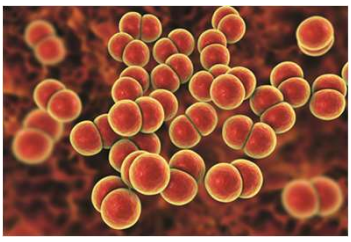

image from: https://www.pharmaceutical-journal.com/news-and-analysis/news/ongoing-gonorrhoea-outbreak-in-england-could-become-untreatable-with-first-line-therapy/20204506.article?firstPass=false

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Morbidity and Mortality Weekly Report

Update to CDC's Treatment Guidelines for Gonococcal Infection, 2020

Sancta St. Cyr, MD[1]; Lindley Barbee, MD[1,2]; Kimberly A. Workowski, MD[1,3]; Laura H. Bachmann, MD[1]; Cau Pham, PhD[1]; Karen Schlanger, PhD[1]; Elizabeth Torrone, PhD[1]; Hillard Weinstock, MD[1]; Ellen N. Kersh, PhD[1]; Phoebe Thorpe, MD[1]

Sexually transmitted infections (STIs) caused by the bacteria *Neisseria gonorrhoeae* (gonococcal infections) have increased 63% since 2014 and are a cause of sequelae including pelvic inflammatory disease, ectopic pregnancy, and infertility and can facilitate transmission of human immunodeficiency virus (HIV) (1,2). Effective treatment can prevent complications and transmission, but *N. gonorrhoeae*'s ability to acquire antimicrobial resistance influences treatment recommendations and complications (3). In 2010, CDC recommended a single 250 mg intramuscular (IM) dose of ceftriaxone and a single 1 g dose of azithromycin for treatment of uncomplicated gonococcal infections of the cervix, urethra, and rectum as a strategy for preventing ceftriaxone resistance and treating possible coinfection with *Chlamydia trachomatis* (4). Increasing concern for antimicrobial stewardship and the potential impact of dual therapy on commensal organisms and concurrent pathogens (3), in conjunction with the continued low incidence of ceftriaxone resistance and the increased incidence of azithromycin resistance, has led to reevaluation of this recommendation. This report, which updates previous guidelines (5), recommends a single 500 mg IM dose of ceftriaxone for treatment of uncomplicated urogenital, anorectal, and pharyngeal gonorrhea. If chlamydial infection has not been excluded, concurrent treatment with doxycycline (100 mg orally

disseminated quinolone-resistant gonococcal strains in the United States, CDC no longer recommended fluoroquinolone treatment, leaving cephalosporins as the only recommended antimicrobial class (6). Availability of *C. trachomatis* nucleic acid amplification tests were widespread by 2010, but CDC recommended gonococcal dual therapy with a cephalosporin (ceftriaxone 250 mg IM or cefixime 400 mg orally) and either azithromycin or doxycycline (4) to reflect concerns regarding emerging gonococcal resistance. By 2011, the minimum inhibitory concentrations (MICs) of cefixime necessary to inhibit *N. gonorrhoeae* growth in vitro were increasing. In 2012, cefixime was no longer a recommended gonococcal regimen (7), with ceftriaxone and azithromycin combination therapy the only recommended regimen for uncomplicated gonorrhea (5). Since publication of the 2015 Sexually Transmitted Diseases (STD) Treatment Guidelines, concerns regarding antimicrobial stewardship have increased, especially the impact of antimicrobial use on the microbiome and data indicating azithromycin resistance (elevated MICs) for gonorrhea and other organisms (1,3). Pharmacokinetic and pharmacodynamic modeling has also affected the understanding of optimal antimicrobial dosing for *N. gonorrhoeae* treatment. This update provides the rationale

New Update December 2020

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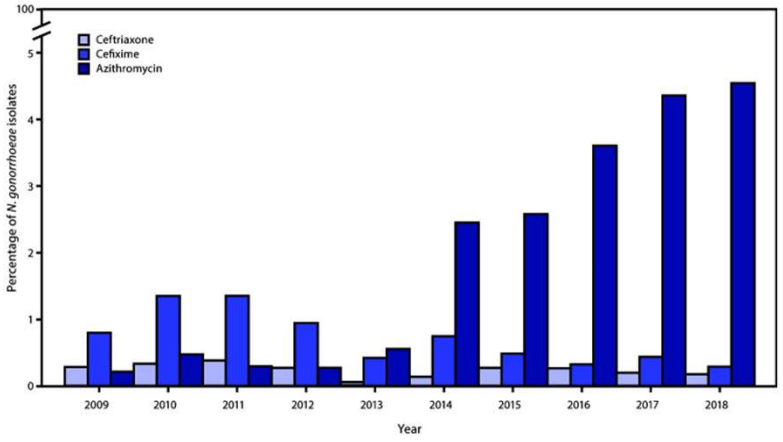
Gonorrhea



St Cyr S, Barbee L, Workowski KA, et al. Update to CDC's Treatment Guidelines for Gonococcal Infection, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(50):1911-1916. Published 2020 Dec 18. doi:10.15585/mmwr.mm6950a6

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Gonorrhea

- Treatment
  - Ceftriaxone (**weight-based dosing**)
    - 500mg if <150kg
    - 1gm if ≥150 kg
  - PLUS **doxycycline 100mg** orally twice daily x 7 days
    - If chlamydia has not been ruled out

- Alternative Treatments
  - cefixime **800 mg orally** x 1
  - PLUS doxycycline 100mg orally twice daily x 7 days
- Gentamicin 240mg IM x 1
- Azithromycin 2gm orally x 1

- Penicillin Allergy
  - gemifloxacin 320mg x 1 PLUS azithromycin 2gm
  - gentamicin 240 mg IM x1 PLUS azithromycin 2gm

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Gonorrhea

- DGI Treatment (arthritis)
  - ceftriaxone 1gm IM once daily x 7 days
  - PLUS **doxycycline 100mg** orally twice daily x 7 days
    - If chlamydia has not been ruled out
  - Alternative
    - cefotaxime 1gm IV every 8 hours OR
    - ceftizoxime 1gm IV every 8 hours
  - PLUS **doxycycline 100mg** orally twice daily x 7 days
  - If chlamydia has not been ruled out
- DGI Treatment(meningitis and endocarditis)
  - ceftriaxone 1-2gm IV every 12-24 hours
  - PLUS **doxycycline 100mg** orally twice daily x 7 days
    - If chlamydia has not been ruled out

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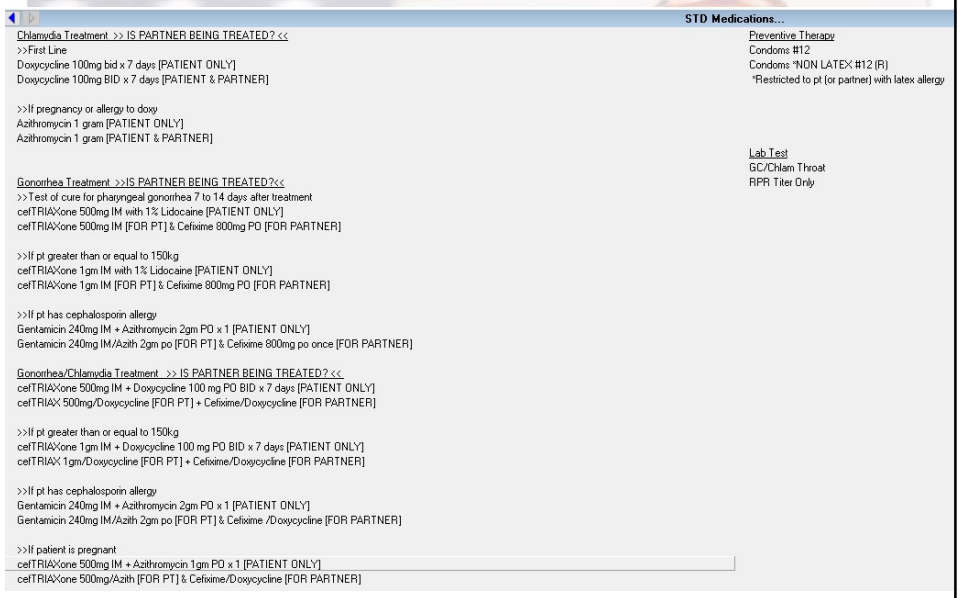

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Trichomonas

- Cause
  - Trichomonas vaginalis
- Prevalence
- Signs and symptoms

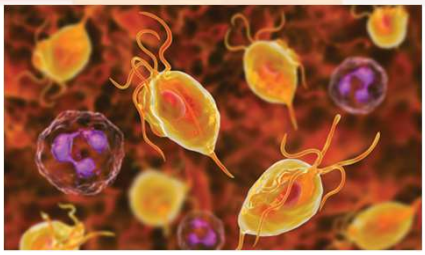

image from: http://www.clpmag.com/2018/11/routine-nucleic-acid-amplification-testing-trichomoniasis/

- Treatment
  - metronidazole 500 mg orally twice daily x 7 days
    - For women
  - metronidazole 2 gm orally x 1
    - For men
  - Alternative
    - tinidazole 2 gm orally x 1

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Syphilis

- Cause
  - *Treponema pallidum*
- Prevalence
- Signs and symptoms
  - 3 active stages
    - Primary
    - Secondary
    - Tertiary
- Complications
  - Congenital syphilis

image from: https://www.drugtargetreview.com/news/32711/success-culturing-treponema-pallidum/

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Syphilis

- Signs and Symptoms
- Primary
  - Chancre
- Secondary
  - Skin rash
  - Condyloma lata
  - Mucocutaneous lesions
  - Lymphadenopathy
- Tertiary
  - Cardiac
  - Gummatous lesions
  - Argyll Robertson pupils
  - Tabes dorsalis
  - General paresis

Syphilis

- Diagnosis
  - Definitive method
    - Culture from lesion
  - Presumptive
    - Nontreponemal
    - Treponemal
  - Neurosyphilis
    - CSF-VDRL
    - Serological tests
    - Neurological tests

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Syphilis

- Treatment-PEN G
  - Primary and Secondary Syphilis
    - Benzathine penicillin G 2.4 million units IM x 1
    - Penicillin allergic patients
      - Doxycycline 100mg by mouth 2 times daily x 14 days
      - Tetracycline 500mg by mouth 4 times daily x 14 days

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Syphilis

- Treatment-PEN G
  - Early Latent Syphilis
    - Benzathine penicillin G 2.4 million units IM x 1

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Syphilis

- Treatment-PEN G
  - Late Latent or Tertiary Syphilis
    - Benzathine penicillin G 7.2 million units total
      - 2.4 million units IM x 3 at 1-week intervals
- Missed doses
  - Unclear recommendations
    - General population intervals of 10-14 days between doses may be ok
    - In pregnancy, repeat series if >9 days between doses

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Syphilis

- Treatment-PEN G
  - Neurosyphilis and Ocular Syphilis
    - Aqueous crystalline penicillin G 18–24 million units/day x 10–14 days
  - Alternative
    - Procaine penicillin 2.4 million units IM once/day PLUS
    - Probenecid 500mg orally 4 times daily x 10-14 days

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Syphilis

- Treatment of sexual partners
  - Patient diagnosed with primary, secondary, or early latent
    - Treat all sexual partners with encounters <90 days from diagnosis
    - May treat sexual partners with encounters >90 days from diagnosis
      - If test results aren't available
      - If follow up is uncertain
  - Patient with syphilis of unknown duration with high nontreponemal serologic test titers (> 1:32)
  - Patients diagnosed with late latent syphilis should have partners evaluated
  - Have sexual contacts notified and evaluated

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Syphilis

Stage	Treatment	Alternative
Primary Syphilis	Benzathine penicillin G 2.4 million units IM x 1	Doxycycline 100mg by mouth 2 times daily x 14 days Tetracycline 500mg by mouth 4 times daily x 14 days
Secondary Syphilis	Benzathine penicillin G 2.4 million units IM x 1	Doxycycline 100mg by mouth 2 times daily x 14 days Tetracycline 500mg by mouth 4 times daily x 14 days
Early Latent Syphilis	Benzathine penicillin G 2.4 million units IM x 1	
Late Latent Syphilis	Benzathine penicillin G 7.2 million units total 2.4 million units IM x 3 at 1-week intervals	Doxycycline 100mg by mouth 2 times daily x 28 days Ceftriaxone 2gm IV or IM daily x 10-14 days
Neurosyphilis	Aqueous crystalline penicillin G 18–24 million units/day x 10–14 days	Procaine penicillin 2.4 million units IM once/day PLUS Probenecid 500mg orally 4 times daily x 10-14 days
Ocular Syphilis	Aqueous crystalline penicillin G 18–24 million units/day x 10–14 days	Procaine penicillin 2.4 million units IM once/day PLUS Probenecid 500mg orally 4 times daily x 10-14 days

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Genital Herpes

- Cause
  - HSV infections
- Prevalence
- Signs and symptoms
- Complications
  - aseptic meningitis
  - extragenital lesions
  - neonatal herpes
  - hepatitis

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Genital Herpes

- Treatment
  - Initial episode
    - Oral Antivirals for 7-10 days
      - Acyclovir 400 mg orally 3 times per day
      - *Acyclovir 200 mg orally 5 times per day*
      - Valacyclovir 1gm orally 2 times per day
      - Famciclovir 250 mg orally 3 times per day

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Genital Herpes

- Treatment
  - Episodic treatment
    - Acyclovir 400 mg orally 3 times per day x 5 days
    - Acyclovir 800 mg orally 2 times per day x 5 days
    - Acyclovir 800 mg orally 3 times per day x 2 days
    - Valacyclovir 500 mg orally 2 times per day x 3 days
    - Valacyclovir 1gm orally 1 time per day x 5 days
    - Famciclovir 125 mg orally 2 times per day x 5 days
    - Famciclovir 1g orally 2 times per day x 1 day
    - Famciclovir 500 mg orally x 1 then 250 mg 2 times daily x 2 days

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Genital Herpes

- Treatment
  - Suppressive
    - Acyclovir 400 mg orally 2 times daily
    - Valacyclovir 500 mg +orally daily
    - Valacyclovir 1gm orally daily
    - Famciclovir* 250 mg orally 2 times daily

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Genital Herpes-Oral Therapies		
Agent	Dose	Duration
Initial Treatment		
Acyclovir	400mg 3 times daily	7-10 days
Acyclovir	200mg 5 times daily	7-10 days
Valacyclovir	1gm 2 times daily	7-10 days
Famciclovir	250mg 3 times daily	7-10 days
Episodic Treatment		
Acyclovir	400mg 3 times daily	5 days
Acyclovir	800mg 2 times daily	5 days
Acyclovir	800mg 3 times daily	2 days
Valacyclovir	500mg 2 times daily	3 days
Valacyclovir	1gm 1 time daily	5 days
Famciclovir	125mg 2 times daily	5 days
Famciclovir	1mg 2 times daily	1 day
Famciclovir	500mg 1 time then 250mg 2 times daily	3 days
Suppressive Treatment		
Acyclovir	400mg 2 times daily	n/a
Valacyclovir	500mg 1 time daily	n/a
Valacyclovir	1gm 1 time daily	n/a
Famciclovir	250mg 2 times daily	n/a

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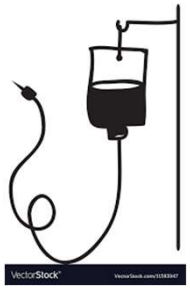
Genital Herpes

- Treatment
  - Severe Disease
    - IV acyclovir 5-10 mg/kg IV every 8 hours x 2-7 days
      - followed by oral therapy for 10 days
  - HSV Encephalitis
    - 21 days of IV therapy



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Genital Herpes

- Antiviral resistance
  - Foscarnet (40-80 mg/kg) IV every 8 hours
  - Cidofovir 5 mg/kg IV once weekly
  - Imiquimod topically
    - off label use
  - Cidofovir gel 1% topically

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Genital Herpes Treatment
>>First episode
valACYclovir 1 Gm BID X 10 Days
>>Recurrent episode
valACYlovir 1 GM QDay x 5 Days
>>Suppressive therapy for recurrent HSV2
valACYclovir 500mg Qday

Oral Herpes Treatment
>>First episode
valACYclovir 1 Gm BID X 10 Days
>>Recurrent episode W/ Mil/Mod Symptoms
valACYclovir 2 Gm q12h x 1 day
>>Suppressive Tx for Recurrent & Severe Symptoms
valACYclovir 500mg Qday

Syphilis Treatment
>>Primary Secondary or Early Latent (<1 year)
Pen G (Bicillin LA) Inj 2.4 Mil Units x 1 (Syphilis Tx)
>>Tertiary or Late Latent (>1 yr) of unknown duration
Pen G (Bicillin LA) Inj 2.4 Mil Units Weekly x 3 (Syphilis)

>>Penicillin Allergy Primary Secondary or Early Latent
Doxycycline 100mg bid x 14 days
>>Penicillin Allergy Tertiary or Late Latent of unknown duration
Doxycycline 100mg bid x 28 days

Trichomoniasis Treatment

First Line
metroNIDAZOLE 500mg bid x 7 days

Second Line Treatment if adherence problematic with first line
metroNIDAZOLE 2 gram x 1 dose

Treatment failure if second treatment failure
metronNIDAZOLE 2 gram BID x 7 days

High Risk Populations

- Men who have sex with Men (MSM)
- HIV infection
- Pregnancy
- Adolescents

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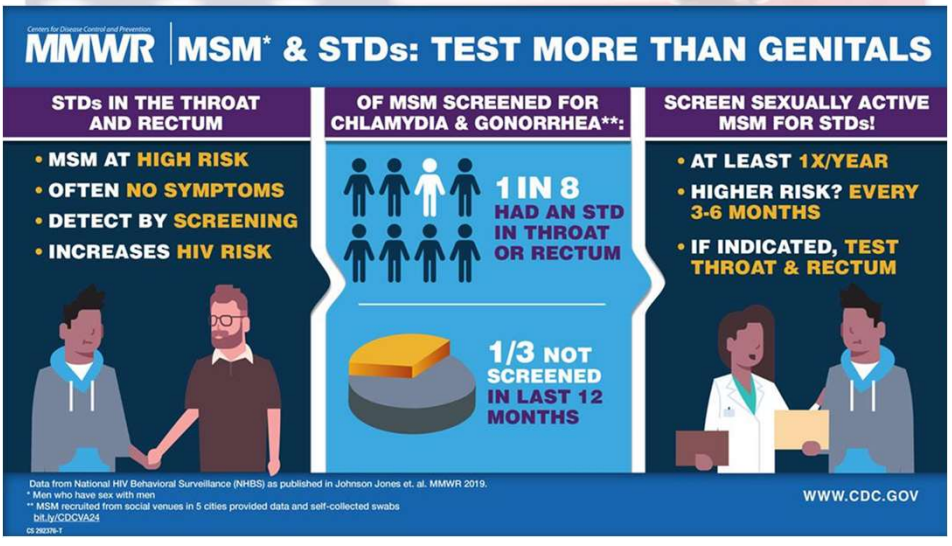

Johnson Jones ML, Chapin-Bardales J, Bizune D, et al. Extragenital Chlamydia and Gonorrhea Among Community Venue–Attending Men Who Have Sex with Men — Five Cities, United States, 2017. MMWR Morb Mortal Wkly Rep 2019;68:321–325. DOI: http://dx.doi.org/10.15585/mmwr.mm6814a1 external icon

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Men Who Have Sex with Men

Chlamydia	• At least annually for sexually active MSM at sites of contact (urethra, rectum) regardless of condom use[2] • Every 3 to 6 months if at increased risk (i.e., MSM on PrEP, with HIV infection, or if they or their sex partners have multiple partners)[2]
Gonorrhea	• At least annually for sexually active MSM at sites of contact (urethra, rectum, pharynx) regardless of condom use[2] • Every 3 to 6 months if at increased risk[2]
Syphilis	• At least annually for sexually active MSM[2] • Every 3 to 6 months if at increased risk[2]
Herpes	• Type-specific serologic tests can be considered if infection status is unknown in MSM with previously undiagnosed genital tract infection[2, 6]
HIV	• At least annually for sexually active MSM if HIV status is unknown or negative and the patient or their sex partner(s) have had more than one sex partner since most recent HIV test[2, 8, 18] • Consider the benefits of offering more frequent HIV screening (e.g., every 3–6 months) to MSM at increased risk for acquiring HIV infection.
HPV, Cervical Cancer, Anal Cancer	• Digital anorectal rectal exam[2] • Data is insufficient to recommend routine anal cancer screening with anal cytology[2]
Hepatitis B Screening	• All MSM should be tested for HBsAg, HBV core antibody, and HBV surface antibody[12]
Hepatitis C Screening	• All adults over age 18 years should be screened for hepatitis C except in settings where the hepatitis C infection (HCV) positivity is < 0.1%[13]

https://www.cdc.gov/std/treatment-guidelines/screening-recommendations.htm

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https://www.cdc.gov/std/saw/talktesttreat/images/ttt-banner2.jpg

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Review Questions Answers

Risk assessment/education, pre-exposure vaccinations, and identifying/treating patients are avenues for STD prevention.

A test of cure is not typically recommended, but if a repeat test is desired, do not retest until before 4 weeks or a false positive may result.

The treatment for gonorrhea infections of the cervix, urethra, rectum, and pharynx should be Ceftriaxone weight-based dosing. If the patient is <150kg they will get a 500mg dose or the patient would get a 1gm if they are ≥150 kg. Doxycycline 100mg orally twice daily x 7 days should be added on if a chlamydial co-infection has not been ruled out. If the patient is pregnant, and it is unsure if chlamydia is present, these patients would be treated with weight-based ceftriaxone and azithromycin.

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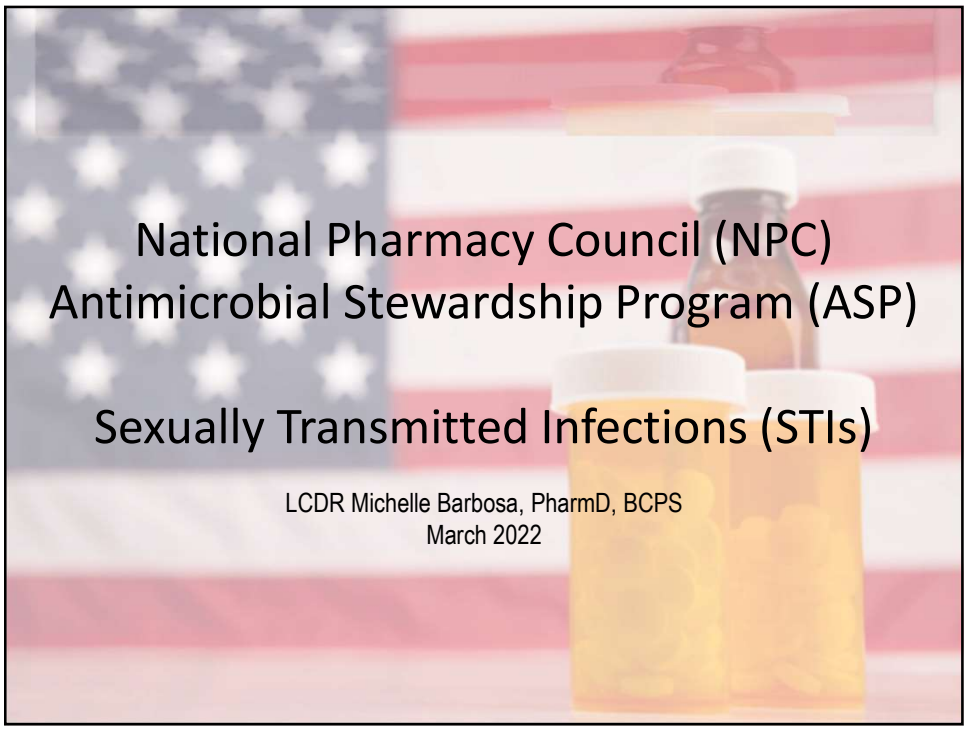
National Pharmacy Council (NPC)
Antimicrobial Stewardship Program (ASP)
Sexually Transmitted Infections (STIs)
LCDR Michelle Barbosa, PharmD, BCPS
March 2022