



Bloodborne Pathogens

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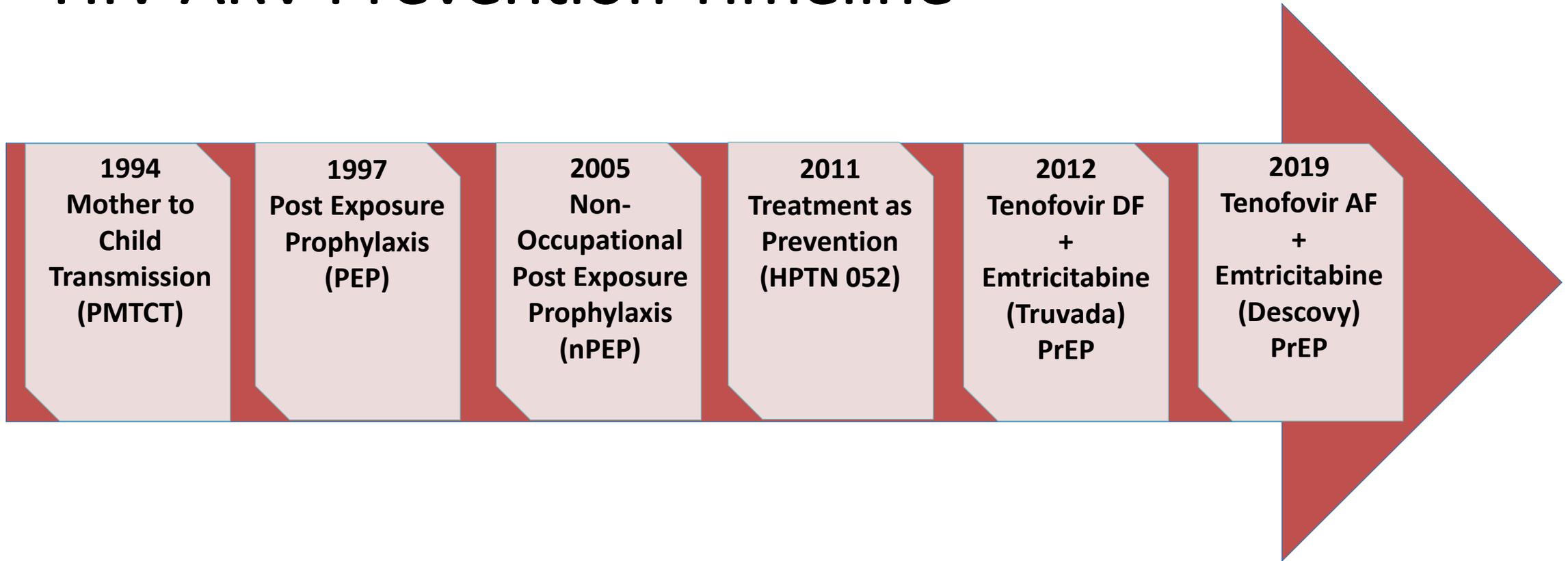
11/27/19

Dakotas AETC Webcast

Objectives

- *Identify risk factors for HIV, HBV and HCV acquisition in needle sticks*
- *Review recommended HIV post-exposure prophylaxis (PEP and nPEP) regimens*
- *Review testing timeline for patients with (non) occupational HIV exposure- understanding HBV/HCV*

HIV ARV Prevention Timeline



Case 1

5 year old male sticks him self on the the finger from a needle found in mom's car. Mom reports her friend borrowed the car earlier in that day and she suspect the friend injects drugs. There was blood in the hub of needle. She asks what should she do next?

You advise her to clean the wound thoroughly with soap and water and bring the needle and the child into the office immediately.



Case 1 Question 1

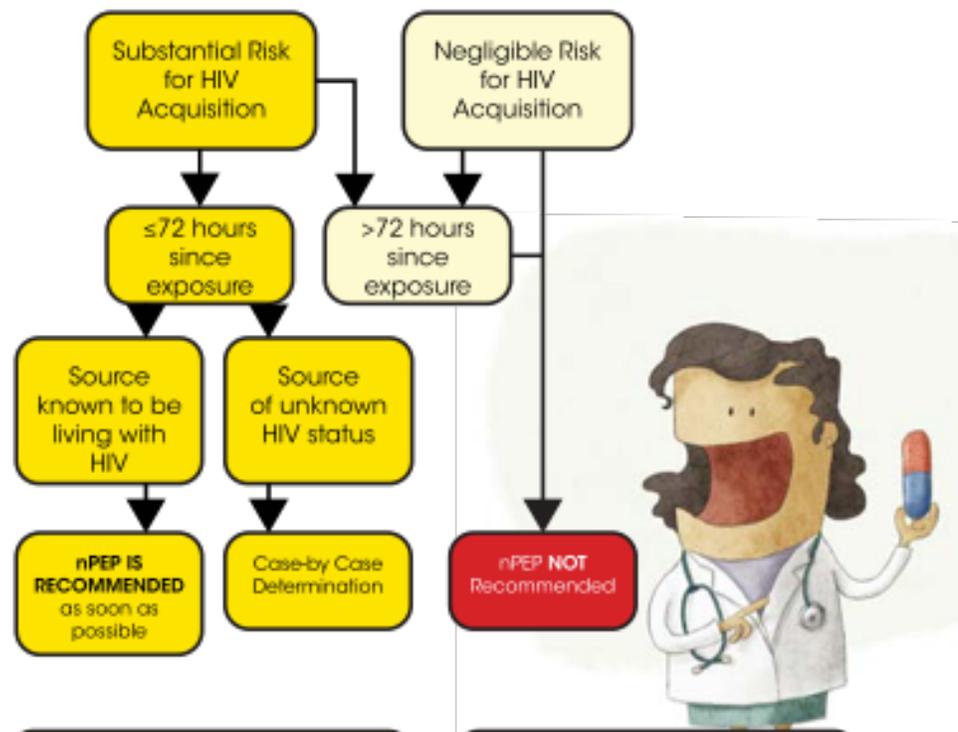
Which of the following risk factors/questions do you need to ask to help establish the risk for HIV (HBV and HCV) acquisition and the need for nPEP?

- A. HIV status of source patient
- B. Method of Transmission
- C. Inoculum type
- D. Volume of inoculum
- E. All of the above

Needle Stick Risk Factors

- HIV/HCV status
 - Acute
 - Asymptomatic/Undetectable (HIV)
 - Unknown (low risk)
 - Unknown (high risk: IDU)
- Transmission
 - IV
 - IM
 - Deep transcutaneous w/bleeding
 - Superficial transcutaneous no bleeding
 - Mucosal only (eye/mouth)
 - Intact skin
- Inoculum
 - Fresh blood
 - Dried blood
 - Semen
 - Tears, urine, saliva
- Volume
 - Massive
 - Measurable
 - Moderate (large bore)
 - Small (small bore)
 - Trace (suture)
 - High vs. Low dead space needles (HCV)

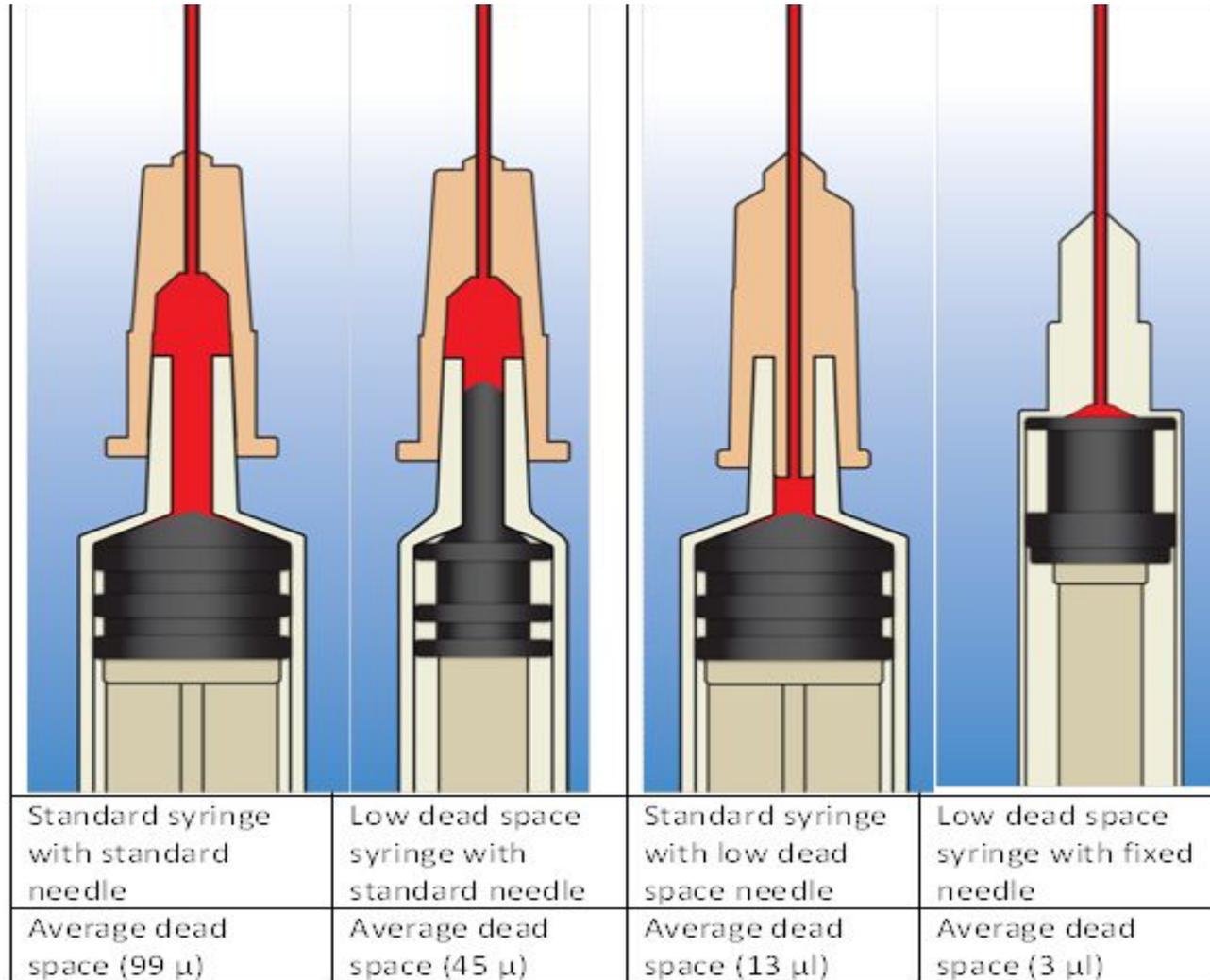




Substantial Risk for HIV Acquisition
Exposure of vagina, rectum, eye, mouth, or other mucous membrane, non-intact skin, or percutaneous contact
With blood, semen, vaginal secretions, rectal secretions, breast milk, or any body fluid that is visibly contaminated with blood
When the source is known to be living with HIV

Negligible Risk for HIV Acquisition
Exposure of vagina, rectum, eye, mouth, or other mucous membrane, non-intact skin, or percutaneous contact
With urine, nasal secretions, saliva, sweat, or tears if not visibly contaminated with blood
Regardless of the known or suspected HIV status of the source

High vs. Dead Space



*Many Syringe Service Programs use low dead space needles

Online tools

- HIV Needle Stick Risk Assessment Stratification Protocol (CJEM 2003;5(1)46-28)

mdcalc.com/hiv-needle-stick-risk-assessment-stratification-protocol-rasp

Google: HIV needle stick calculator

The screenshot shows the MD+CALC website interface. At the top, there is a search bar with the text "Search 'QT interval' or 'QT' or 'EKG'". Below the search bar is a promotional banner that says "Wish CME was easy? It is with MDCalc! Get up to \$100 of free CME credits." The main content area features a blue header that reads "MDCalc is launching CME!". Below this is a call to action: "Give us feedback for points towards free CME." with a "Sign up now!" button. The main title of the tool is "HIV Needle Stick Risk Assessment Stratification Protocol (RASP)" with a star icon. A sub-header states: "Quantifies HIV exposure risk by source and exposure type and need for prophylaxis." There are two tabs: "When to Use" and "Why Use". The "Why Use" tab is active, showing a text box: "The HIV Needle Stick Risk Assessment Protocol quantifies gives healthcare workers a more objective risk assessment of getting HIV after a needle stick." Below this is a table with two columns: "Source population" and "Points".

Source population	Points
Acute AIDS illness defined as "end stage AIDS, hospitalized, high viral load"	Known HIV+: acute AIDS illness +1
Unknown HIV status, high-risk situation defined as "suspected HIV, IV drug user, unknown needle with high local HIV prevalence"	Known HIV+: asymptomatic HIV +10
	Unknown HIV status: high-risk situation +100
	Unknown HIV status: low-risk situation +1000

At the bottom, there is a green box labeled "Result:" with the text "Please fill out required fields."

What about nPEP?

Timing...when is nPEP (PEP) too late?

- Animal models and animal PEP studies: suggest substantially less effective beyond 24 - 36 hours^{1,2}
- Case-control study: most subjects in each group received PEP within 4 hours³
- Analysis of PEP failures does not suggest a clear cut-off⁴



1. Tsai C-C et al. J Virol 1998;72:4265-73.
2. Shih CC et al. JID 1991.
3. Cardo DM et al. NEJM 1997;337:1485-90.
4. MMWR June 29, 2001;50(RR11);1-42

What do the guidelines say?

- “nPEP is most effective when initiated as soon as possible after HIV exposure; it is unlikely to be effective when instituted > 72 hours after exposure.” CDC 2016
- “Decisions regarding initiation of nPEP beyond 36hrs of exposure should be made on a case-by-case basis with the realization of diminished efficacy when timing of initiation is prolonged.” NYDOH

cdc.gov/hiv/pdf/programresources/cdc-hiv-npep-guidelines.pdf

hivguidelines.org/pep-for-hiv-prevention/

Case 1 Question 2

You decide to prescribe nPEP in this 5 year old patient as well within the time frame from initial exposure. You prescribe 28 days of:

- A. Atripla (Efavirenz/Emtricitabine/Tenofovir DF)
- B. Combivir (Lamivudine/Zidovudine) and Kaletra (Lopinavir/ritonavir)
- C. Isentress (Raltegravir) and Truvada (Emtricitabine/Tenofovir DF)
- D. Tivicay (Dolutegravir) and Descovy (Emtricitabine/Tenofovir AF)

Preferred nPEP Regimens

Age group	
≥ 13 years with normal renal function (creatinine clearance ≥ 60 mL/min)	Tenofovir DF 300 mg/Emtricitabine 200 mg (Truvada) once daily <u>with</u> Raltegravir 400 mg twice daily or Dolutegravir 50 mg once daily
Children aged 2-12 years	Tenofovir DF + Emtricitabine <u>with</u> Raltegravir
Children < 2 years	Zidovudine + Lamivudine soln. <u>with</u> Raltegravir (susp) or Lopinavir/ritonavir soln (Kaletra)

HIV is DYNAMIC

- Dolutegravir > Raltegravir
 - Once day dosing
 - Better drug at fighting HIV
 - ≥ 20 kg DHHS Pediatric dosing guidelines recommend 50 mg
- Bictegravir > Dolutegravir
 - Better drug at fighting HIV
 - Co-formulated with Tenofovir AF and Emtricitabine (one small pill once daily)
- Emtricitabine/ Tenofovir AF (Descovy) > Emtricitabine/ Tenofovir DF (Truvada)
 - Better side effect profile
 - Smaller size
- Injectables!

Case 2

28 yo intoxicated female is brought in by police to ED. She was found in hotel room with a 45 yo male ~2 hours ago. She reports they drank alcohol, did "some drugs" and had at least oral sex...she can't remember if there was more sexual contact.



Case 2 continued

- What is her risk for contracting HIV?
- Are there factors that might affect this risk?
- Do you prescribe nPEP?

Per-act Risk for HIV Acquisition

Exposure type	Rate for HIV acquisition per 10,000 exposures
Parenteral	
Blood transfusion	9,250
Needle sharing during IDU	63 (1 in 158)
Percutaneous (needle stick)	23 (1 in 435)
Sexual	
Receptive anal intercourse	138 (1 in 72)
Receptive penile-vaginal intercourse	8 (1 in 1250)
Insertive anal intercourse	11 (1 in 909)
Insertive penile-vaginal intercourse	4 (1 in 2500)
Receptive oral intercourse	low
Insertive oral intercourse	low
Other	
Biting, spitting, throwing body fluids (semen or saliva), sharing sex toys	Negligible

Other Factors

- Increased risk
 - Concomitant STDs (Chemsex)
 - Acute or late stage HIV infection
 - High HIV viral load
 - Hollow bore needle
 - Large diameter needles?
- Decreased risk
 - Condom use
 - Male circumcision
 - ARV treatment
 - PrEP
- CDC: Know the HIV Risk (AIDS 2014;28(10)1509-19)
[cdc.gov/hivrisk/estimator.html#](https://www.cdc.gov/hivrisk/estimator.html#)

Customize your content

Know the HIV Risk

What is HIV? ▾

How do I know if I have HIV? ▾

Can I get or transmit HIV from...? ▾

What can increase HIV risk? ▾

What can decrease HIV risk? ▾

What are the best ways to decrease my chances of getting or transmitting HIV?

Find free, fast, & confidential HIV testing near you.

Enter ZIP

Privacy | Accessibility | Disclaimer
About | FOIA | Policies | No Fear Act | OIG

HIV Risk Reduction Tool
Beta Version

Learn more about this site

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Search the site

What do you want to do?

Customize your content...

This tool allows you to access information that is individually tailored to meet your needs. Just answer the following questions to get started!

I am looking for information for someone who is...

M Male F Female T Transgender

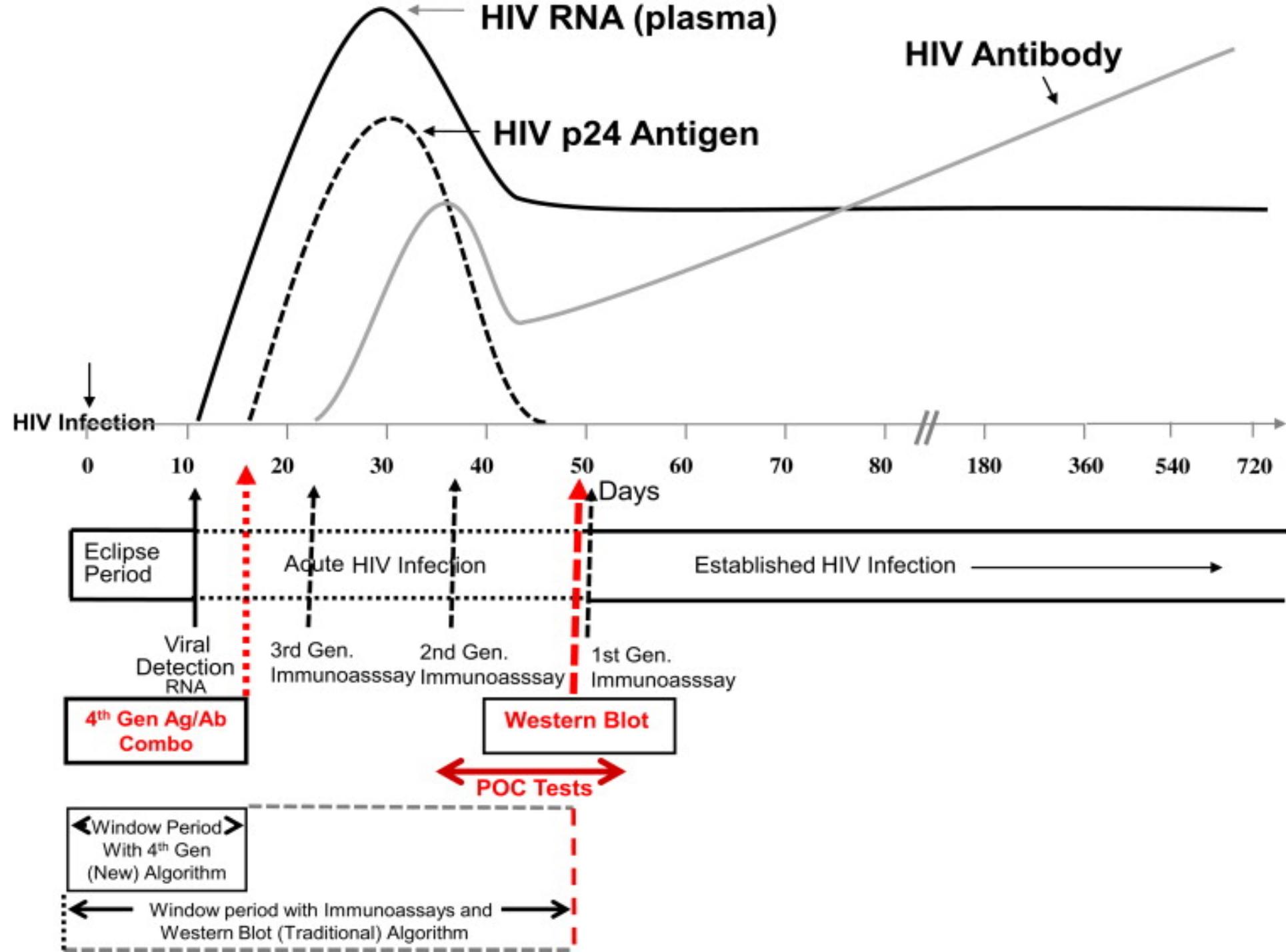
Gender Status Partners

All selections are optional. You can change your selections at any time. The answers you give will not be kept after you close out of your Internet browser.

Case 2 Question 1

What initial tests would you order for today prior to starting HIV nPEP?

- A. Hepatitis C RNA Quantitative PCR
- B. Hepatitis B surface antibody
- C. HIV RNA Quantitative PCR
- D. Hepatitis A antibody



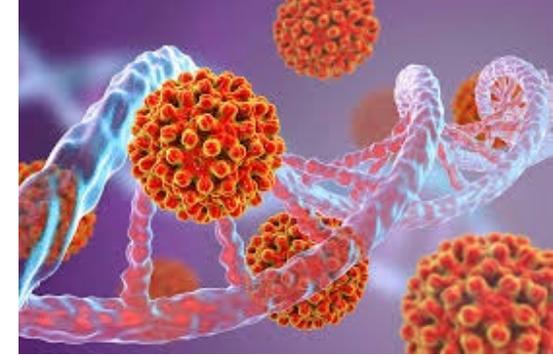
Test	Source	Exposed persons			
	Baseline	Baseline	4–6 weeks after exposure	3 months after exposure	6 months after exposure
	For all persons considered for or prescribed nPEP for any exposure				
HIV Ag/Ab testing ^a (or antibody testing if Ag/Ab test unavailable)	✓	✓	✓	✓	✓ ^b
Hepatitis B serology, including: hepatitis B surface antigen hepatitis B surface antibody hepatitis B core antibody	✓	✓	—	—	✓ ^c
Hepatitis C antibody test	✓	✓	—	—	✓ ^d
For all persons considered for or prescribed nPEP for sexual exposure					
Syphilis serology ^e	✓	✓	✓	—	✓
Gonorrhea ^f	✓	✓	✓ ^g	—	—
Chlamydia ^f	✓	✓	✓ ^g	—	—
Pregnancy ^h	—	✓	✓	—	—
For persons prescribed tenofovir DF+ emtricitabine + raltegravir or tenofovir DF+ emtricitabine + dolutegravir					
Serum creatinine (for calculating estimated creatinine clearance ⁱ)		✓	✓	—	—
Alanine transaminase, aspartate aminotranferase		✓	✓	—	—
For all persons with HIV infection confirmed at any visit					
HIV viral load	✓			✓ ^j	
HIV genotypic resistance	✓			✓ ^j	

Case 2 Question 2

She reports she was fully vaccinated as a child and you forgot to obtain baseline hepatitis B serologies. Now, at her 6 month follow up her hepatitis serologies should indicate if the source patient was known to be HBV uninfected:

- A. HBsAg+, HBsAb-, HBcAb+, ALT normal
- B. HBsAg-, HBsAb+, HBcAb-, ALT normal
- C. HBsAg-, HBsAb-, HBcAb+, ALT normal
- D. HbsAg+, HBsAb-, HBcAb+, ALT 500

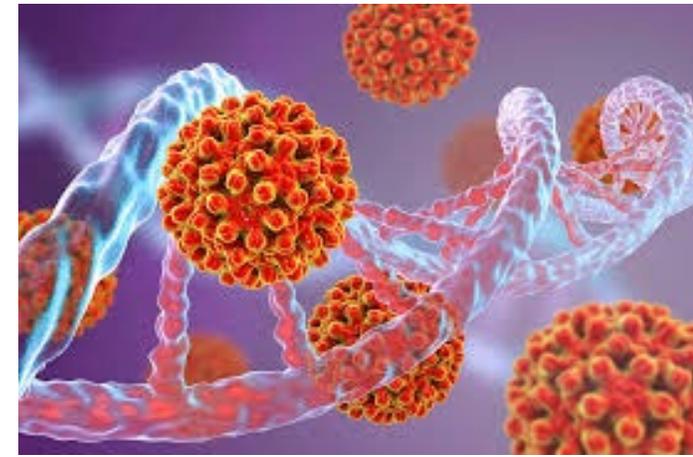
Hepatitis B virus (HBV)



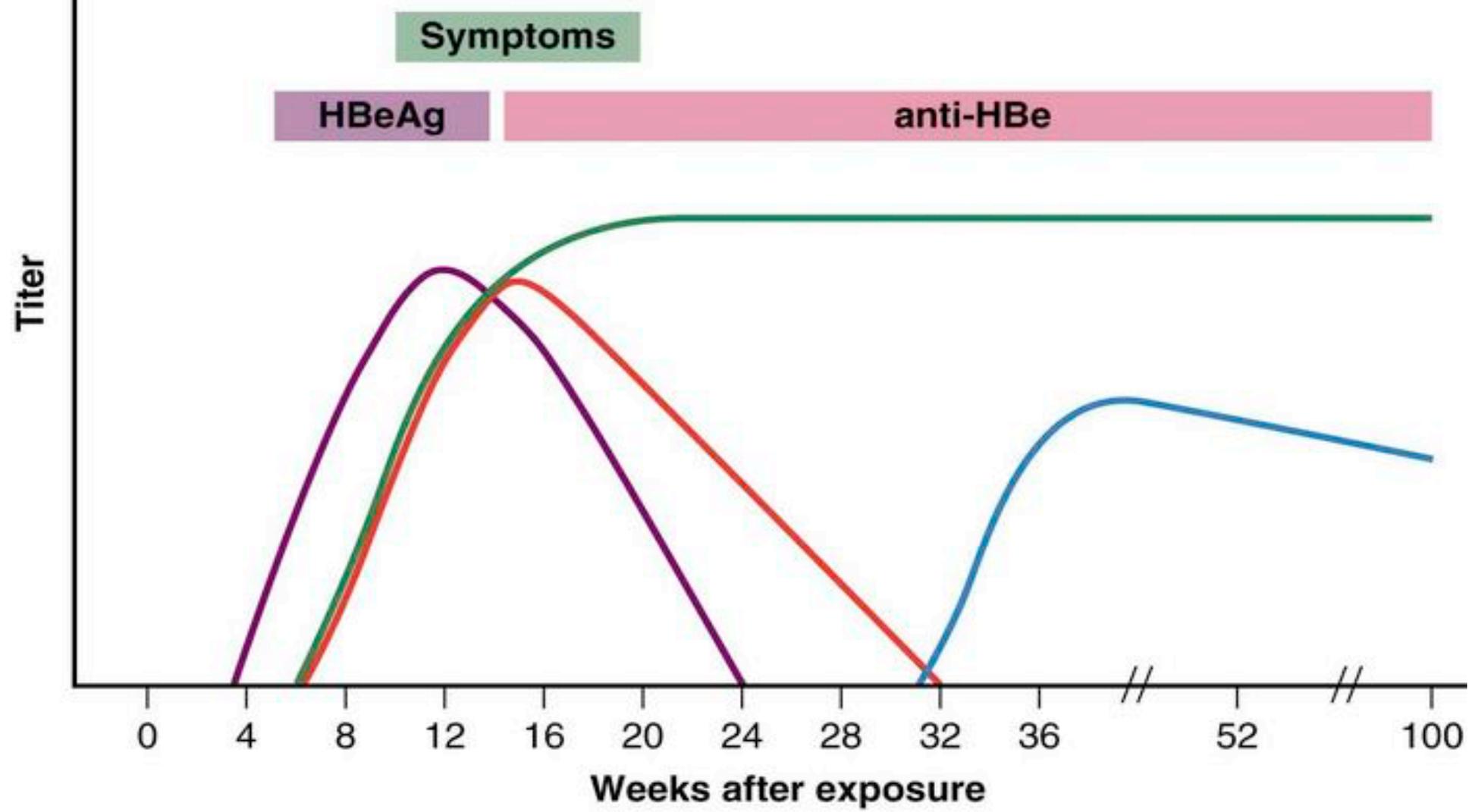
- Incubation 90 days (60-150 days)
- Risk of HBV from a needlestick or cut exposure to HBV-infected blood ranges from 6-30%
 - Depends on the source hepatitis B e antigen (HBeAg) status
- HBsAg = Infectious
 - Detection indicates the person is infectious
 - Detected in blood ~4 weeks (1-10 weeks)
 - In patients who clear HBV infection becomes negative 3-6 months
- HBsAb (anti-HBs) = Immunity
 - Indicates recovery and immunity after acute HBV
 - Prior Vaccinated
- HBcAb (anti-HBc): appears at onset of symptoms in acute infection
 - Persists for life

HBV tests cont..

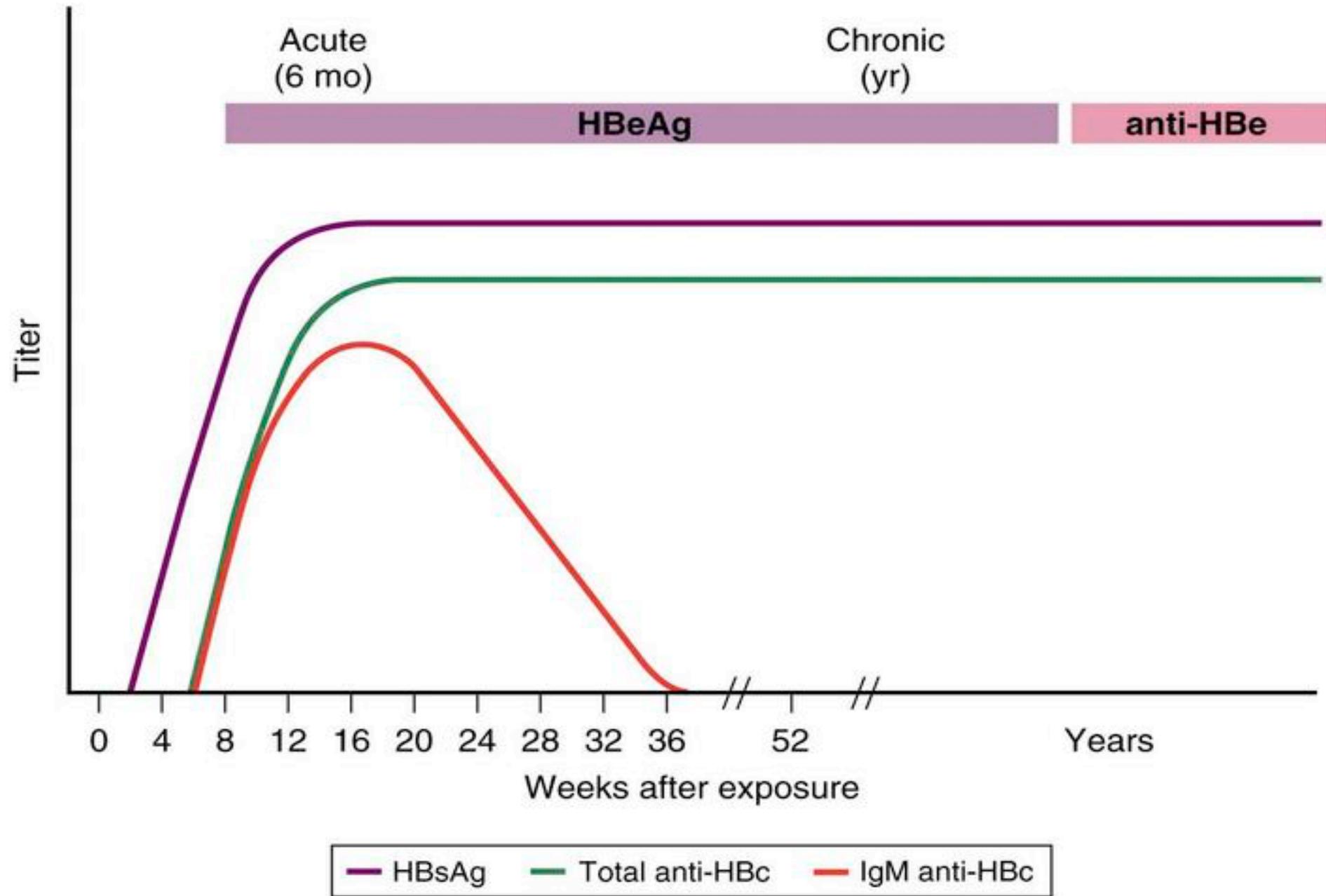
- HBcAb IgM (IgM anti-HBc)
 - Indicates acute infection in the last 6 months
- HBeAg
 - Secreted product of the nucleocapsid gene of HBV
 - Indicates active viral replication
- HBeAb (ant-Hbe)
 - Produced temporarily during acute HBV infection or after a burst of replication
- HBV DNA
 - Within 30 days after acute infection/exposure



Acute Hepatitis B Virus Infection with Recovery Typical Serologic Course



Progression to Chronic Hepatitis B Virus Infection Typical Serologic Course



Interpretation of HBV Tests

Test	Acute HBV	Immunity via Infection	Immunity via Vaccination	Chronic HBV	Healthy Carrier
HBsAg	+	-	-	+	+
HBsAb	-	+	+	-	-
HBcAb	+	+	-	+	+
HBcAb IgM	+	-	-	-	-
HBeAg	+	-	-	+/-	-
HBeAb	-	+/-	-	+/-	+
HBV DNA	+	-	-	+	+ (low)
ALT	↑	Normal	Normal	Normal/High	Normal

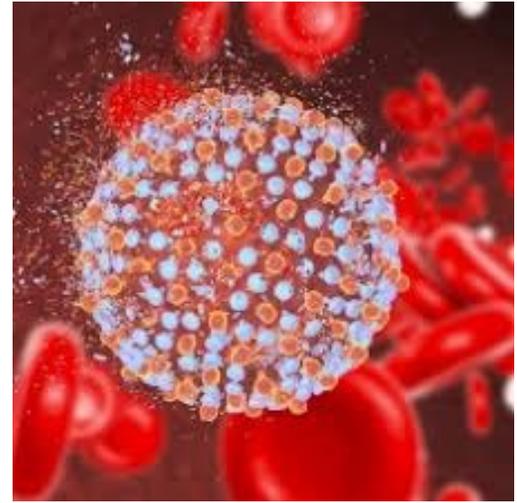
Case 2 Question 3

Her baseline HCV Ab was negative and she asks what is the approximate risk % for sexual acquisition of HCV if her partner has chronic HCV?

- A. 0.07%
- B. 0.7%
- C. 7%
- D. 17%

Hepatitis C virus (HCV)

- Incubation 45 days (6-112 days)¹
- Risk of HCV from a needlestick ~1.8%
- No serologic marker for acute infection
- HCV Ab
 - Appears 6-8 weeks after exposure²
 - False negatives: immunocompromised, acute hepatitis, recent known HCV exposure
- HCV RNA
 - Confirmatory
 - Appears 1-3 weeks after exposure (peaks 8 weeks)^{1,3,4}
- HCV Ab+, HCV RNA not detected
 - Prior cleared infection



More on HBV and HCV

	HBV	HCV
US chronic disease	700,000-1.4 million ^{1,2}	2.7 million ³
Sexual Transmission	<ul style="list-style-type: none"> • Accounts for 2/3 of new cases⁴ • 50-100x more infectious than HIV⁴ 	<ul style="list-style-type: none"> • Very low • 0.07% per year in serodiscordant couples⁵
Symptoms	Fever, Fatigue, Anorexia, Nausea, Emesis, Abdominal pain Arthralgias, Jaundice, Dark urine	
Likelihood of Symptomatic Acute Infection	<ul style="list-style-type: none"> • 5-15% age 1-5yo^{6,7} • 30-50% age >5yo^{6,7} • 5-15% immunosuppressed adults⁹ 	<ul style="list-style-type: none"> • 20-30%⁸
Potential for Chronic Infection	<ul style="list-style-type: none"> • 25-50% age 1-5yo^{9,10} • 6-10% older children^{9,10} 	<ul style="list-style-type: none"> • 55-85%^{11,12}
Severity	<ul style="list-style-type: none"> • 12-20% → chronic¹³ 	<ul style="list-style-type: none"> 5-20% → cirrhosis⁸

1. J Infect Dis 2010;202(2):192-20
 2. Hepatology 2012;56(2):422-33
 3. Ann Intern Med. 2014;160(5):293-300
 4. CDC 2013 Viral hepatitis surveillance
 5. Hepatology 2013;57(3):881-9
 6. Am Fam Physician 2004;69:75-82
 7. J Hepatol 2000;32:89-97

8. Hepatology 2001;33:321-327
 9. J Infect Dis 1982;146(2):198
 10. J. Med Virol 1987;22(1);1
 11. J Infect Dis 2004;190:1270-1274
 12. Hepatology 1997;26(3):521
 13. J Hepatology 2008;42(2):335

Closing thoughts on bloodborne pathogens

- Needles sticks:
 - Clean wound with soap and water
 - Type of syringe
 - Time since exposure, source status, transmission (IV/IM), inoculum type, volume of inoculum
- PEP and nPEP regimens are the same, guidelines updated every 4-5 years
 - HIV and anti-retrovirals are
 - Integrase inhibitor + FTC/TDF
 - 28 days
- Testing timeline
 - HIV is important in all types of exposure but, often the greatest concern is HBV, HCV then HIV transmission if source status unknown

Resources

- Needlesticks
 - mdcalc.com/hiv-needle-stick-risk-assessment-stratification-protocol-rasp
- HIV risk
 - cdc.gov/hivrisk/estimator.html#
- nPEP Guidelines
 - cdc.gov/hiv/pdf/programresources/cdc-hiv-npep-guidelines.pdf
 - AETC Toolkit 2018: aidsetc.org/npep
 - NYDH: hivguidelines.org/pep-for-hiv-prevention/occupational/#tab_0