Occupational Postexposure Prophylaxis

This is a PDF version of the following document:
Module 5: Prevention of HIV
Lesson 3: Occupational Postexposure Prophylaxis

You can always find the most up-to-date version of this document at https://www.hiv.uw.edu/go/prevention/occupational-postexposure-prophylaxis/core-concept/all.

Introduction

Background

Although exposure prevention remains the primary strategy for reducing occupationally acquired HIV, appropriate postexposure management is an important element of workplace safety. The first iteration of the U.S. Public Health Service (USPHS) recommendations advocating the use of occupational postexposure prophylaxis (PEP) dates back to 1996.[1] As more data emerged and more antiretroviral medications became available, the occupational PEP guidelines were updated four times (Figure 1), with the most recent of these published as the 2013 USPHS Occupational PEP Guidelines.[2,3,4,5] Occupational exposures, particularly those known to involve risk for HIV transmission, are urgent medical matters, and clinicians should be familiar with updated occupational PEP guidelines. In addition, all health care facilities and clinics should have policies and procedures in place to ensure that appropriate mechanisms are available for timely management. Issues related to the management of nonoccupational exposures to HIV are addressed in the Topic Review Nonoccupational Postexposure Prophylaxis. Management of hepatitis B virus (HBV) or hepatitis C virus (HCV) is not addressed in this topic review, but recommendations are available from the Centers for Disease Control and Prevention (CDC).[6,7]

Definition of Health Care Worker/Health Care Personnel

For the purposes of initiating occupational PEP, the 2013 USPHS Occupational PEP Guidelines use the term health care personnel to refer to all paid and unpaid persons working in health care settings who have the potential for exposure to infectious materials, including body substances (blood, tissue, and specific body fluids), contaminated medical supplies and equipment, and contaminated environmental surfaces.[2] Health care personnel (also called health care workers) might include, but are not limited to, emergency medical service personnel, dental personnel, laboratory personnel, autopsy personnel, nurses, nursing assistants, physicians, technicians, therapists, pharmacists, students and trainees, contractual staff not employed by the health care facility, and persons not directly involved in patient care but potentially exposed to blood and body fluids (e.g., clerical, dietary, housekeeping, security, maintenance, and volunteer personnel). In addition, the 2013 USPHS Occupational PEP Guidelines note the same principles of exposure management could be used for similar types of exposures that occur in other occupational settings, such as might occur with public safety officers.

History of Occupational HIV Cases in the United States

In the United States, from 1985 to 2013, a total of 58 confirmed and 150 possible cases of occupational transmission of HIV were reported to the CDC; only one of the confirmed cases occurred after 1999 and that

case involved a laboratory worker who had a needle puncture wound while working with a live HIV culture (Figure 2).[8] Of the 58 confirmed cases of occupationally acquired HIV, 49 resulted from a percutaneous cut or puncture, 5 from mucocutaneous exposure, 2 from both percutaneous and mucous membrane exposure, and 2 were unknown.[8]

Estimated Risk for Occupational Acquisition of HIV

- **Risk with Percutaneous Exposure**: If a health care worker has a percutaneous exposure to blood from a source person with HIV (and the health care worker does not take PEP), the estimated risk for HIV acquisition is approximately 0.2 to 0.3%.[9,10,11]
- **Risk with Mucous Membrane Exposure**: After a mucous membrane exposure to blood from a source with HIV, such as eye or mouth contact with blood, the risk is approximately 0.09%.[2]
- **Risk with Blood Contact of Nonintact Skin**: Transmission of HIV through blood contact of nonintact skin has been documented in case reports, but most experts consider this risk significantly lower than with mucous membrane exposure.
- **Factors Associated with Increased Transmission Risk**: Epidemiological studies have identified several factors associated with increased risk of HIV transmission following an occupational exposure: a larger quantity of blood from the source patient (device visibly contaminated with blood, needle recently used in an artery or vein, larger bore needle, deeper injury).[12] Note that in earlier years of the HIV epidemic, terminal AIDS was considered a surrogate marker for a high plasma HIV RNA level typically seen in late-stage AIDS. In the modern era, the source patient's recent plasma HIV RNA level would be considered to have a higher correlation with transmission risk than their stage of HIV disease or CD4 cell count.[12] Table 1.

  Risk Factors for HIV Seroconversion in Health Care Workers

Risk Factor	Adjusted Odds Ratio
Deep Injury	15.0
Visible Blood on Device	6.2
Terminal Illness in Source Patient	5.6
Needle in Source Vein/Artery	4.3
Postexposure Prophylaxis with Zidovudine	0.19

  Source:
  - Cardo DM, Culver DH, Ciesielski CA, et al. A case-control study of HIV seroconversion in health care workers after percutaneous exposure. Centers for Disease Control and Prevention Needlestick Surveillance Group. N Engl J Med. 1997;337:1485-90. [PubMed Abstract]

Rationale for Occupational HIV PEP

When an individual has a percutaneous or mucous membrane exposure to blood or potentially infectious fluid from a source person with HIV, replication of HIV first occurs in the dendritic cells of the skin and mucosa before spreading through lymphatic vessels and developing into systemic infection; this delay in the spread of HIV is thought to leave a window of opportunity for HIV PEP to prevent establishment of chronic HIV infection.

A landmark study published in 1997 provided the first convincing evidence that HIV PEP significantly decreased the risk of occupational HIV acquisition following a needlestick injury.[12] In this report, investigators performed a case-control study of needlestick injuries involving health care workers and demonstrated that zidovudine PEP, which was typically taken for at least 4 weeks, reduced the risk of HIV seroconversion by 81% if implemented within 4 hours of the exposure.[12] This study, along with CDC recommendations, led to the widespread use of antiretroviral therapy for occupational HIV PEP in the late 1990s.

From the year 2000 onward, occupationally acquired HIV infection in the United States has become exceedingly rare, an observation that indirectly supports the efficacy of HIV PEP.[8] In addition, there are data supporting the use of HIV PEP based on small observational studies among humans and animal transmission models.[13,14,15,16,17,18] There have been no published randomized control trials that evaluated HIV PEP for occupational exposures to HIV, and due to ethical and logistical reasons, it is unlikely that such studies will ever be performed in the future. On the basis of available data, there is a strong rationale for using HIV PEP for health care workers exposed to HIV.[2]

Risk Assessment of the Occupational Exposure Event

General Approach

First, it is important to determine whether the exposure involving the health care worker warrants HIV PEP. In general, this assessment should include (1) HIV status of the source patient, (2) type of body fluid involved in the exposure, (3) nature of the exposure (percutaneous, mucous membrane, or contact with nonintact skin), and (4) timing of when the exposure occurred.[5] If the exposure is deemed an occupational exposure to a source patient known to have HIV, additional information should be obtained, such as the source patient's most recent plasma HIV RNA level, their current antiretroviral treatment (if any), and any history of HIV drug resistance. Further, as part of the overall exposure evaluation, the risk assessment for transmission of hepatitis B virus or hepatitis C virus should be undertaken.[6,7] Even in circumstances where a source patient's HIV, HBV, and HCV status is unknown (or unobtainable), the health care worker should still be evaluated as soon as possible to facilitate timely baseline testing and discussion of whether HIV PEP should be considered.

Determining HIV Status of Source Patient

The use of HIV PEP applies to situations in which a health care worker has experienced an exposure to blood or body fluids from a source patient with documented or suspected HIV. The HIV status of the source patient, if unknown, should be determined in a timely fashion to guide the appropriate use of HIV PEP.[2] In many health care settings, clinicians have access to FDA-approved point-of-care HIV tests that can provide a preliminary determination of a source patient's HIV serostatus within 30 minutes. These tests perform well in detecting persons with chronic HIV but have poor sensitivity in detecting acute or very recent HIV infection. The newer point-of-care HIV-1/2 antigen-antibody test (Alere Determine) has also shown relatively poor performance in detecting persons with very recent HIV infection.[19,20] In contrast, the laboratory/instrument-based HIV-1/2 antigen-antibody immunoassays have relatively high sensitivity in detecting recent (acute) HIV infection.[21,22] Any preliminary positive point-of-care test result requires confirmation with additional HIV testing. If an immediate result is needed and an HIV point-of-care test is not available, occupational HIV PEP should not be delayed while waiting for the test results.[2] In the situation where a source patient's HIV status is initially unknown and the health care worker starts on antiretroviral PEP, discontinuation of the antiretroviral occupational HIV PEP is warranted if test results subsequently show the source patient does not have HIV.[2]

Source Patient in Seroconversion Window Period

Persons with very recent acquisition of HIV can have detectable HIV RNA levels with a negative HIV antibody test result and thus potentially transmit HIV in the setting of this seroconversion window period; when using newer recommended HIV-1/2 antigen-antibody immunoassays, the window period is shortened by approximately 1 week (Figure 3).[23] There have been no documented occupational transmissions of HIV related to an exposure involving a source patient with very recent acquisition of HIV who was in the seroconversion window period. Accordingly, administering HIV PEP in the setting of a negative HIV antibody test for the source patient is not recommended, unless the source patient is known to have signs or symptoms that strongly suggest acute HIV. In addition, for source persons of unknown HIV status, routine use of HIV RNA testing for diagnostic purposes is not recommended for decision-making regarding PEP.

Relative Risks of Infectious Body Fluids

As part of the evaluation for an occupational exposure to HIV, it is important to determine what type and quantity of body fluid from the source patient involved in the exposure (Figure 4).[2] Blood or visibly bloody fluids are considered the most potentially infectious body fluids. Other body fluids that are also considered potentially infectious, but at lower risk than blood or visibly bloody fluids include semen, vaginal fluids, and fluids found in normally sterile areas of the body (cerebrospinal, synovial, pleural, pericardial, peritoneal, and

amniotic). The risk of transmission from vomitus, feces, urine, nasal secretions, sputum, sweat, and tears is not considered potentially infectious unless they are visibly bloody.[2]

Type of Exposure

In the initial evaluation of the health care worker, it is essential to determine if the exposure involved (1) percutaneous injury, (2) mucous membrane exposure, or (3) contact with nonintact skin. The contact of blood or body fluid with intact skin does not confer any risk of HIV transmission and thus does not warrant further evaluation or postexposure management. For needlestick injuries, additional information should include if the skin of the health care worker was punctured, the type and gauge of needle involved, whether the injury sustained was deep or shallow, and if visible blood was present on the needle prior to injury.

Timing of Exposure

As part of the initial evaluation, determination should be made regarding when the exposure took place. Health care workers with an occupational exposure to HIV should immediately seek care, since available data suggest that HIV PEP should be started as soon as possible. Most health care workers promptly seek evaluation after an exposure, but certain circumstances can arise that result in a significant delay. It is particularly important to determine if the delay is longer than 72 hours from the incident, and expert consultation is recommended if that situation arises.[2]

Defining an At-Risk Exposure

For the purposes of initiating HIV PEP, the 2013 USPHS Occupational PEP Guidelines define an at-risk exposure as contact with blood, tissue, or other potentially infectious body fluids from a person with known or suspected HIV via (1) percutaneous injury (e.g., a needlestick or cut with a sharp object), (2) mucous membrane exposure, or (3) contact with nonintact skin (e.g., exposed skin that is chapped, abraded, or affected by significant dermatitis).[2]

Recommended Initial Steps Following An Exposure Event

Initial Approach Following Exposure Event

Occupational exposures should be considered an urgent medical issue and addressed immediately. Thus, it is extremely important that health care workers have an immediate evaluation and consultation following an exposure event that may have involved contact with blood or potentially infectious fluid from a source person with HIV.[2] Prior to any discussions regarding HIV PEP, it is essential to make sure the health care worker has adequately decontaminated the wound or mucous membranes. In addition, one of the goals of the initial evaluation is to make sure the health care worker promptly receives the first doses of antiretroviral medications for HIV PEP, if indicated. All health care facilities should have a plan in place for administering appropriate evaluation and management of a health care worker who has an occupational exposure to a bloodborne pathogen.

Wound Decontamination

All exposure events should prompt an immediate effort to decontaminate the area of the body exposed to potentially infectious fluids. If the wound involved a needlestick injury, wash the area thoroughly with soap and water (if the health care worker was wearing a glove, the glove should be removed prior to washing the wound).[2] The health care worker should not squeeze or “milk” the injury site. For a mucous membrane exposure, the health care worker should thoroughly wash and irrigate the area with a large volume of saline.[2] If the exposure involves skin (intact or nonintact), the skin should be thoroughly washed with soap and water.[2]

Timing for Initiation of Antiretroviral Therapy

Occupational exposures should be considered an urgent medical issue and addressed immediately. Thus, health care workers should receive their first dose of antiretroviral medications promptly after the exposure, ideally within 30 to 90 minutes after the exposure event. In some situations, significant delays occur, usually because the health care worker failed to initially consider the exposure event significant enough to seek evaluation. When a delay occurs, but is less than 72 hours, HIV PEP should still be offered (if warranted by the exposure). If the delay extends past 72 hours, HIV PEP is likely to be less effective, and expert consultation should be obtained;[2] in this situation, some experts will consider giving HIV PEP, particularly in cases considered a very high risk for HIV acquisition. Animal studies have shown that HIV PEP is most effective when started as early as possible after exposure (Figure 5).[14,17]

Recommended Antiretroviral Regimens for Occupational HIV PEP

Preferred Regimens for Occupational HIV PEP

The 2013 USPHS Occupational PEP Guidelines recommend use of three or more antiretroviral medications for occupational HIV PEP, with the preferred regimen consisting of raltegravir 400 mg twice daily plus tenofovir DF-emtricitabine one tablet daily.[2] Of note, these guidelines were published prior to the FDA approval of dolutegravir, which is discussed below. Large-scale studies involving treatment of persons with HIV have shown tenofovir DF-emtricitabine plus raltegravir is safe, highly effective, well tolerated, and has minimal drug interactions.[24] From a practical standpoint, the first doses of antiretroviral HIV PEP should include both tenofovir DF-emtricitabine and raltegravir (the health care workers should NOT take raltegravir alone for the first dose). Although raltegravir 1,200 mg once-daily has been approved for use as a treatment dose in people with HIV, the recommended dosing of raltegravir is 400 mg twice daily.[3]

Table 12. **USPHS Guidelines for the Use of Antiretroviral Agents for Occupational Exposures to HIV**

HIV Postexposure Prophylaxis Regimens

Preferred HIV Postexposure Prophylaxis Regimen
• Raltegravir (400 mg twice daily) plus Tenofovir DF-Emtricitabine (300 mg-200 mg [1 tablet] daily)

Alternative HIV Postexposure Prophylaxis Regimens

May combine 1 anchor drug or drug pair from the left column with 1 pair of nucleoside/nucleotide reverse transcript from the right column; prescribers unfamiliar with these agents/regimens should consult clinicians who are familiar agents and their toxicities[a]

Anchor Drug	**Nucleoside Reverse Transcriptase Inhibitors**
• Raltegravir • Darunavir + ritonavir • Etravirine • Rilpivirine • Atazanavir + ritonavir • Lopinavir-ritonavir	• Tenofovir DF-emtricitabine • Tenofovir DF + lamivudine • Zidovudine-lamivudine • Zidovudine + emtricitabine

The following alternative is a complete fixed-dose combination regimen, and no additional antiretroviral medication
Elvitegravir-cobicistat-tenofovir DF-emtricitabine

Alternative Agents for Use as PEP Only with Expert Consultation	**Agents Generally Not Recommended for Use as PEP**	**Agents Contraindicated PEP**
• Abacavir • Efavirenz • Enfuvirtide • Fosamprenavir • Maraviroc • Saquinavir • Stavudine	• Didanosine • Nelfinavir • Tipranavir	• Nevirapine

Note. For consultation or assistance with HIV PEP, contact the National Clinician Consultation Center's Post-Exposure Hotline at telephone number 888-448-4911 or visit its website at http://nccc.ucsf.edu/

[a]The alternatives regimens are listed in order of preference; however, other alternatives may be reasonable based on and clinician preference.

Source:

- Kuhar DT, Henderson DK, Struble KA, et al. Updated US Public Health Service Guidelines for the Management of Occupational Exposures to Human Immunodeficiency Virus and Recommendations for

Postexposure Prophylaxis. Infect Control Hosp Epidemiol. 2013;34:875-92. [PubMed Abstract]

Use of Dolutegravir for Occupational HIV PEP

Since the release of the 2013 USPHS Occupational PEP Guidelines, the integrase strand transfer inhibitor dolutegravir received FDA approval and has emerged as a first-line antiretroviral medication as a component of the antiretroviral regimen for initial therapy in persons with HIV.[25] Based on the excellent experience with dolutegravir in persons with HIV, many experts have substituted dolutegravir for raltegravir for use in occupational HIV PEP. In addition, the CDC HIV nPEP CDC Recommendations, which were released after the approval of dolutegravir, include dolutegravir as a component of a preferred regimen for nonoccupational HIV PEP.[26] Further, dolutegravir is dosed once daily, has a higher genetic barrier to resistance than raltegravir, and is active against some HIV isolates that have resistance to raltegravir.[27]

Alternative Regimens for Occupational HIV PEP

Alternative regimens are provided in the 2013 USPHS Occupational PEP Guidelines if concern exists that the source patient has drug resistance to any agent of the preferred regimen, as well as for circumstances, such as in a rural area, when a site may only have access to alternative medications until preferred medications can be obtained through ordering.[2] Certain medications should be avoided in selecting alternative regimens for HIV PEP. For example, the medication nevirapine should never be used in the provision of HIV PEP due to the potential risk of fatal hepatotoxicity and serious skin reactions.[28] Similarly, abacavir should not be used for HIV PEP because of the risk of developing a potentially fatal abacavir hypersensitivity reaction. Although HLA-B*5701 testing can be performed and predict those at risk of developing the hypersensitivity reaction, it may take several days for results to return. It is possible, however, that a switch to abacavir while taking an HIV PEP regimen could be indicated, assuming HLA-B*5701 testing is negative and there is a strong reason to consider a medication switch, such as intolerance to tenofovir DF.

Use of Tenofovir alafenamide-Emtricitabine for Occupational HIV PEP

Since the release of the 2013 USPHS Occupational PEP Guidelines, the medication tenofovir alafenamide-emtricitabine has received FDA approval (2016) and has emerged as a component of multiple first-line antiretroviral regimens for initial therapy in persons with established HIV, as well as for some indications for HIV preexposure prophylaxis.[25] At this time, however, tenofovir alafenamide-emtricitabine (or any fixed-dose combination containing tenofovir alafenamide-emtricitabine) is not recommended for routine use for occupational HIV PEP, based on very little data regarding its use for occupational HIV PEP. Further, tenofovir DF and tenofovir alafenamide should not be viewed as interchangeable, since the tissue distribution and kinetics of these two medications are very different. The key circumstance that would warrant consideration for the use of tenofovir alafenamide-emtricitabine for occupational HIV PEP would be when initiating occupational HIV PEP in a person with known renal disease who has an estimated creatinine clearance between 30 and 60 mL/min (given the established association between tenofovir DF and renal toxicity).

Duration of Therapy

The 2013 USPHS Occupational PEP Guidelines recommend that health care workers who initiate antiretroviral therapy for HIV PEP should complete a 28-day course.[2] Older studies involving macaques have shown that HIV PEP given for 28 days is more effective than 10 days, which is more effective than 3 days.[14] The pervading theory is that, in most instances, HIV PEP aborts a very early HIV infection, rather than truly preventing any cell in the body from becoming infected with HIV. Thus, prompt initiation of HIV PEP is important to minimize the tissue involvement, and continuing therapy for 28 days is important to control HIV replication while allowing sufficient time for localized immune responses to clear out a very limited HIV infection.

Use of PEP if Source Person has Undetectable HIV RNA Level

If the source patient has a recent undetectable HIV RNA level, the risk of transmission from an occupational exposure is likely to be significantly reduced. Nevertheless, undetectable plasma HIV RNA in the source patient does not eliminate the possibility that transmission of HIV could occur, especially with a needlestick injury. Plasma viral load measurements reflect only the level of cell-free virus in the peripheral blood, not the persistence of HIV in latently infected cells present in whole blood. Thus, even when the source patient with HIV infection has an undetectable plasma HIV RNA level, the 2013 USPHS Occupational PEP Guidelines recommend that HIV PEP should still be offered.[2]

Health Care Worker is Pregnant or Has Childbearing Potential

For pregnant women who require occupational HIV PEP, expert consultation is advised. The preferred regimen, raltegravir plus tenofovir DF-emtricitabine, is considered safe during pregnancy and for women who become pregnant while taking this regimen.[29] The use of dolutegravir plus tenofovir DF-emtricitabine is also considered safe in pregnancy and for women of childbearing potential.[29] One of the alternative recommended anchor medications—darunavir boosted with ritonavir—can cause significant drug interactions with oral contraceptives.[29]

Choice of PEP Regimen with Known or Suspected HIV Drug Resistance

Rare cases of documented occupational HIV PEP failure have occurred due to transmission of drug-resistant HIV from the source patient.[30,31] In the case of known or suspected resistance in the source virus to antiretroviral medications, expert consultation is strongly advised. If access to an expert is not immediately available, initiation of standard HIV occupational PEP should take place without delay; the regimen can be adjusted after initiation as additional information or advice from an expert becomes available.

Obtaining Expert Consultation for Occupational HIV PEP

The 2013 USPHS Occupational PEP Guidelines recommend expert clinical consultation for HIV-related occupational exposures in the following situations:[2]

- Delay of greater than 72 hours from exposure to evaluation
- Unknown source (e.g., needle in sharps disposal container or laundry, source patient declines HIV testing)
- Known or suspected antiretroviral drug resistance of the source virus
- Known or suspected pregnancy in the exposed health care worker
- The exposed health care worker is breastfeeding
- Serious medical illness in the health care worker exposed to HIV
- Development of toxicity from the initial HIV PEP regimen

Expert Consultation: National Clinician Consultation Center PEPline

Expert consultation for health care professionals can be obtained by calling the National Clinician Consultation Center's Post-Exposure Prophylaxis PEPline at (888)-448-4911. See the website for hours of operation.

Baseline Evaluation and Counseling for Health Care Worker

Baseline Evaluation

Health care workers with an occupational exposure to HIV should have prompt counseling, baseline laboratory testing, and medical evaluation.[2] It is important to determine if the health care worker has any preexisting (or significant risk of) renal disease since PEP antiretroviral therapy, specifically tenofovir DF, carries potential nephrotoxicity and requires dose adjustment if renal dysfunction is present, or consideration of alternative HIV PEP medications. The first dose of HIV PEP should be administered as soon as possible and can be given while the individual is undergoing baseline evaluation. It is important the baseline evaluation should not result in a delay in the health care worker receiving their first dose of antiretroviral therapy for HIV PEP. The recommended routine counseling and baseline laboratory testing for the health care worker exposed to a known or suspected source with HIV should include the following (Figure 6):[2,7]

Evaluation of Management of Other Bloodborne Pathogens

For health care workers exposed to a source patient with HIV who has coinfection with HBV and/or HCV, additional baseline testing and management considerations are needed. It is beyond the scope of this topic review to address postexposure prophylaxis for exposures to HBV and/or HCV. In this situation, we recommend using existing CDC guidelines and, if needed, obtaining expert consultation.[6,7]

Initial Counseling

Health care workers who receive HIV PEP should be informed of possible drug interactions, drug toxicities and side effects, the need for high levels of adherence with the HIV PEP regimen, the importance of completing the entire 28-day postexposure course, and the importance of follow-up testing. Health care workers should be advised to use preventative measures (e.g., barrier contraception) to prevent secondary transmission of HIV, especially in the initial 6 to 12 weeks following the exposure. From a practical standpoint, this counseling should not delay the patient receiving their first doses of antiretroviral medications for HIV PEP. Management of pregnant or breastfeeding health care workers who require HIV PEP should involve expert consultation for counseling regarding the risks and benefits of HIV PEP in these settings, concerns regarding potential transmission of HIV, as well as unique considerations for monitoring during the postexposure surveillance period. In addition, the guidelines note that for health care providers who seek to completely eliminate any risk of HIV transmission to their infant, the health care provider may want to consider stopping breastfeeding.

Follow-Up of Health Care Worker After Exposure Event

Early Reevaluation

Early reevaluation of the exposed health care worker within 72 hours of exposure is strongly recommended, both to assess tolerance with the HIV PEP antiretroviral medications and to consider any new information about the source patient that may be available. Providing exposed health care personnel with counseling and education should be considered an essential component of management.

Follow-Up Laboratory Testing

Regardless of whether a health care worker is taking PEP, reevaluation within 72 hours is recommended. If HIV PEP is used, the health care worker should be advised about the importance of completing the prescribed regimen and should undergo close monitoring for any drug toxicities, side effects, or development of acute HIV symptoms during the follow-up period. When using HIV-1/2 antigen-antibody immunoassay as the HIV test, follow-up HIV testing should take place 6 weeks and 16 weeks after the exposure.[2] If HIV antibody testing alone is used, the repeat HIV testing should occur at 6 weeks, 12 weeks, and 24 weeks after the occupational exposure.[2] Some experts also perform testing for complete blood counts and renal and hepatic aminotransferase levels at 2 weeks after the health care worker initiates HIV PEP, but this is infrequently done in the current era, given the excellent safety profile of the medications used for HIV PEP. Further testing may be required in the event of abnormalities or drug toxicities (Figure 7).[2]

Indications for HIV RNA Testing or Extended Follow-Up

Routine use of HIV RNA testing of an exposed health care worker for follow-up after occupational exposure to HIV is not recommended, except in the scenario where the exposed health care worker manifests signs or symptoms suggestive of acute HIV. In the setting of suspected acute HIV infection, it is appropriate to order an HIV-1/2 antigen-antibody immunoassay and an HIV RNA. Based on several case reports of delayed HIV seroconversion in health care workers who also acquired HCV from the exposure event, extended follow-up is indicated if the health care worker becomes infected with HCV. In this situation, most experts recommend follow-up HIV testing out to 12 months, regardless of the method of HIV testing being used.[2,32]

Summary Points

- Following an occupational exposure to HIV, prompt initiation of HIV PEP is an important element of workplace safety, as the use of HIV PEP markedly reduces the risk of HIV acquisition in the health care worker.
- Occupational exposures to blood or potentially infectious bodily fluids should be considered an urgent medical issue and addressed immediately.
- Antiretroviral HIV PEP medication regimens should contain three (or more) antiretroviral drugs for all occupational exposures to HIV; the number of medications should no longer be based on the risk of the exposure.
- The USPHS-recommended regimen for occupational HIV PEP consists of a 28-day course of tenofovir DF-emtricitabine plus raltegravir; this recommendation is based on this regimen's high potency, favorable side effect profile, and minimal drug interactions.
- Many experts also allow for the use of dolutegravir in place of raltegravir due to its once-daily dosing, greater potency, excellent track record in HIV treatment, and higher genetic barrier to resistance.
- Regimens that contain tenofovir alafenamide-emtricitabine are not currently recommended for occupational HIV PEP based on paucity of data for use as occupational HIV PEP.
- If occupational HIV PEP is indicated, the antiretroviral regimen should be started as soon as possible. If a health care worker presents 72 (or more) hours after exposure, expert consultation should be sought.
- Initial evaluation of the exposed person should include both counseling and laboratory studies (baseline HIV testing, complete blood counts, renal and hepatic function tests, and pregnancy testing if pregnancy is possible).
- Expert consultation should be sought for all cases involving drug-resistant HIV in the source patient and for situations that fall outside the scope of the guidelines. Expert consultation can be obtained by calling the National Clinician Consultation Center's Post-Exposure Prophylaxis PEPline at 888-448-4911.
- All health care workers who experience an HIV exposure event, regardless of whether they take HIV PEP, should undergo baseline testing with an HIV-1/2 antigen-antibody Immunoassay, and this test should be repeated 6 and 12 weeks following the exposure.

Citations

1. Centers for Disease Control and Prevention (CDC). Update: provisional Public Health Service recommendations for chemoprophylaxis after occupational exposure to HIV. MMWR Morb Mortal Wkly Rep. 1996;45:468-80.
[PubMed Abstract] -

2. Kuhar DT, Henderson DK, Struble KA, et al. Updated US Public Health Service Guidelines for the Management of Occupational Exposures to Human Immunodeficiency Virus and Recommendations for Postexposure Prophylaxis. Infect Control Hosp Epidemiol. 2013;34:875-92.
[PubMed Abstract] -

3. Panlilio AL, Cardo DM, Grohskopf LA, Heneine W, Ross CS. Updated U.S. Public Health Service guidelines for the management of occupational exposures to HIV and recommendations for postexposure prophylaxis. MMWR Recomm Rep. 2005;54:1-17.
[PubMed Abstract] -

4. Public Health Service guidelines for the management of health-care worker exposures to HIV and recommendations for postexposure prophylaxis. Centers for Disease Control and Prevention. MMWR Recomm Rep. 1998;47:1-33.
[PubMed Abstract] -

5. U.S. Public Health Service. Updated U.S. Public Health Service Guidelines for the Management of Occupational Exposures to HBV, HCV, and HIV and Recommendations for Postexposure Prophylaxis. MMWR Recomm Rep. 2001;50:1-52.
[PubMed Abstract] -

6. Moorman AC, de Perio MA, Goldschmidt R, et al. Testing and Clinical Management of Health Care Personnel Potentially Exposed to Hepatitis C Virus - CDC Guidance, United States, 2020. MMWR Recomm Rep. 2020;69:1-8.
[PubMed Abstract] -

7. Schillie S, Vellozzi C, Reingold A, et al. Prevention of Hepatitis B Virus Infection in the United States: Recommendations of the Advisory Committee on Immunization Practices. MMWR Recomm Rep. 2018;67:1-31.
[PubMed Abstract] -

8. Joyce MP, Kuhar D, Brooks JT. Notes from the field: occupationally acquired HIV infection among health care workers - United States, 1985-2013. MMWR Morb Mortal Wkly Rep. 2015;63:1245-6.
[PubMed Abstract] -

9. Baggaley RF, Boily MC, White RG, Alary M. Risk of HIV-1 transmission for parenteral exposure and blood transfusion: a systematic review and meta-analysis. AIDS. 2006;20:805-12.
[PubMed Abstract] -

10. Bell DM. Occupational risk of human immunodeficiency virus infection in healthcare workers: an overview. Am J Med. 1997;102(suppl 5B):9-15.
[PubMed Abstract] -

11. Patel P, Borkowf CB, Brooks JT, Lasry A, Lansky A, Mermin J. Estimating per-act HIV transmission risk: a systematic review. AIDS. 2014;28:1509-19.
[PubMed Abstract] -

12. Cardo DM, Culver DH, Ciesielski CA, et al. A case-control study of HIV seroconversion in health care workers after percutaneous exposure. Centers for Disease Control and Prevention Needlestick Surveillance Group. N Engl J Med. 1997;337:1485-90.
[PubMed Abstract] -

13. Young TN, Arens FJ, Kennedy GE, Laurie JW, Rutherford Gw. Antiretroviral post-exposure prophylaxis (PEP) for occupational HIV exposure. Cochrane Database Syst Rev. 2007;:CD002835.
[PubMed Abstract] -

14. Tsai CC, Emau P, Follis KE, et al. Effectiveness of postinoculation (R)-9-(2-phosphonylmethoxypropyl) adenine treatment for prevention of persistent simian immunodeficiency virus SIVmne infection depends critically on timing of initiation and duration of treatment. J Virol. 1998;72:4265-73.
[PubMed Abstract] -

15. Bourry O, Brochard P, Souquiere S, et al. Prevention of vaginal simian immunodeficiency virus transmission in macaques by postexposure prophylaxis with zidovudine, lamivudine and indinavir. AIDS. 2009;23:447-54.
[PubMed Abstract] -

16. Dobard C, Sharma S, Parikh UM, et al. Postexposure protection of macaques from vaginal SHIV infection by topical integrase inhibitors. Sci Transl Med. 2014;6:227ra35.
[PubMed Abstract] -

17. Otten RA, Smith DK, Adams DR, et al. Efficacy of postexposure prophylaxis after intravaginal exposure of pig-tailed macaques to a human-derived retrovirus (human immunodeficiency virus type 2). J Virol. 2000;74:9771-5.
[PubMed Abstract] -

18. Subbarao S, Otten RA, Ramos A, et al. Chemoprophylaxis with tenofovir disoproxil fumarate provided partial protection against infection with simian human immunodeficiency virus in macaques given multiple virus challenges. J Infect Dis. 2006;194:904-11.
[PubMed Abstract] -

19. Duong YT, Mavengere Y, Patel H, et al. Poor performance of the determine HIV-1/2 Ag/Ab combo fourth-generation rapid test for detection of acute infections in a National Household Survey in Swaziland. J Clin Microbiol. 2014;52:3743-8.
[PubMed Abstract] -

20. Rosenberg NE, Kamanga G, Phiri S, et al. Detection of acute HIV infection: a field evaluation of the determine® HIV-1/2 Ag/Ab combo test. J Infect Dis. 2012;205:528-34.
[PubMed Abstract] -

21. Mitchell EO, Stewart G, Bajzik O, Ferret M, Bentsen C, Shriver MK. Performance comparison of the 4th generation Bio-Rad Laboratories GS HIV Combo Ag/Ab EIA on the EVOLIS™ automated system versus Abbott ARCHITECT HIV Ag/Ab Combo, Ortho Anti-HIV 1+2 EIA on Vitros ECi and Siemens HIV-1/O/2 enhanced on Advia Centaur. J Clin Virol. 2013;58 Suppl 1:e79-84.
[PubMed Abstract] -

22. Chavez P, Wesolowski L, Patel P, Delaney K, Owen SM. Evaluation of the performance of the Abbott ARCHITECT HIV Ag/Ab Combo Assay. J Clin Virol. 2011 Dec;52 Suppl 1:S51-5.
[PubMed Abstract] -

23. Centers for Disease Control and Prevention and Association of Public Health Laboratories. Laboratory Testing for the Diagnosis of HIV Infection: Updated Recommendations. Published June 27, 2014.

[CDC] -

24. Lennox JL, Dejesus E, Lazzarin A, et al. Safety and efficacy of raltegravir-based versus efavirenz-based combination therapy in treatment-naive patients with HIV-1 infection: a multicentre, double-blind randomised controlled trial. Lancet. 2009;374(9692):796-806.
[PubMed Abstract] -

25. Panel on Antiretroviral Guidelines for Adults and Adolescents. Guidelines for the use of antiretroviral agents in adults and adolescents with HIV. Department of Health and Human Services. What to start: initial combination regimens for the antiretroviral-naïve patient. December 18, 2019.
[HIV.gov] -

26. Dominguez KL, Smith DK, Thomas V, et al. Updated guidelines for antiretroviral postexposure prophylaxis after sexual, injection drug use, or other nonoccupational exposure to HIV—United States, 2016. Atlanta, GA: US Department of Health and Human Services, CDC; 2016.
[CDC] -

27. Shah BM, Schafer JJ, Desimone JA Jr. Dolutegravir: a new integrase strand transfer inhibitor for the treatment of HIV. Pharmacotherapy. 2014;34:506-20.
[PubMed Abstract] -

28. Centers for Disease Control and Prevention (CDC). Serious adverse events attributed to nevirapine regimens for postexposure prophylaxis after HIV exposures--worldwide, 1997-2000. MMWR Morb Mortal Wkly Rep. 2001;49:1153-6.
[MMWR] -

29. Panel on Treatment of HIV During Pregnancy and Prevention of Perinatal Transmission. Recommendations for the Use of Antiretroviral Drugs During Pregnancy and Interventions to Reduce Perinatal HIV Transmission in the United States. Recommendations for Use of Antiretroviral Drugs During Pregnancy. Lack of Experience with Antiretroviral Drugs During Pregnancy and Prior to Pregnancy (Antiretroviral-Naive). June 12, 2025.
[HIV.gov] -

30. Beltrami EM, Luo CC, de la Torre N, Cardo DM. Transmission of drug-resistant HIV after an occupational exposure despite postexposure prophylaxis with a combination drug regimen. Infect Control Hosp Epidemiol. 2002;23:345-8.
[PubMed Abstract] -

31. Lopes GI, Coelho LP, Hornke L, et al. Transmission of a multidrug-resistant HIV-1 from an occupational exposure, in São Paulo, Brazil. AIDS. 2015;29:1580-3.
[PubMed Abstract] -

32. Ridzon R, Gallagher K, Ciesielski C, et al. Simultaneous transmission of human immunodeficiency virus and hepatitis C virus from a needle-stick injury. N Engl J Med. 1997;336:919-22.
[PubMed Abstract] -

References

- Ford N, Irvine C, Shubber Z, et al. Adherence to HIV postexposure prophylaxis: a systematic review and meta-analysis. AIDS. 2014;28:2721-7.
[PubMed Abstract] -

- Lee LM, Henderson DK. Tolerability of postexposure antiretroviral prophylaxis for occupational

exposures to HIV. Drug Saf. 2001;24:587-97.
[PubMed Abstract] -

- Public Health Service statement on management of occupational exposure to human immunodeficiency virus, including considerations regarding zidovudine postexposure use. MMWR Recomm Rep. 1990;39:1-14.
[PubMed Abstract] -

- Raesima MM, Ogbuabo CM, Thomas V, et al. Dolutegravir Use at Conception - Additional Surveillance Data from Botswana. N Engl J Med. 2019;381:885-7.
[PubMed Abstract] -

- 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;62:1-19.
[PubMed Abstract] -

- Siegfried N, van der Merwe L, Brocklehurst P, Sint TT. Antiretrovirals for reducing the risk of mother-to-child transmission of HIV infection. Cochrane Database Syst Rev. 2011;:CD003510.
[PubMed Abstract] -

- U.S. Public Health Service. Updated Information Regarding Antiretroviral Agents Used as HIV Postexposure Prophylaxis for Occupational HIV Exposures. MMWR Recomm Rep. 2007;56(49):1291-2.
[U.S. Public Health Service] -

- Wang SA, Panlilio AL, Doi PA, White AD, Stek M Jr, Saah A. Experience of healthcare workers taking postexposure prophylaxis after occupational HIV exposures: findings of the HIV Postexposure Prophylaxis Registry. Infect Control Hosp Epidemiol. 2000;21:780-5.
[PubMed Abstract] -

- Webster DP. Is HIV post-exposure prophylaxis required following occupational exposure to a source patient who is virologically suppressed on antiretroviral therapy? HIV Med. 2015;16:73-5.
[PubMed Abstract] -

- Zash R, Holmes L, Diseko M, et al. Neural-Tube Defects and Antiretroviral Treatment Regimens in Botswana. N Engl J Med. 2019;381:827-40.
[PubMed Abstract] -

- Zash R, Makhema J, Shapiro RL. Neural-Tube Defects with Dolutegravir Treatment from the Time of Conception. N Engl J Med. 2018;379:979-81.
[PubMed Abstract] -

Figures

Figure 1 Timeline for Occupational Postexposure Prophylaxis Recommendations in the United States

Abbreviations: CDC = Centers for Disease Control and Prevention; PEP = postexposure prophylaxis; INSTI= integrase strand transfer inhibitor

Illustration by David H. Spach, MD

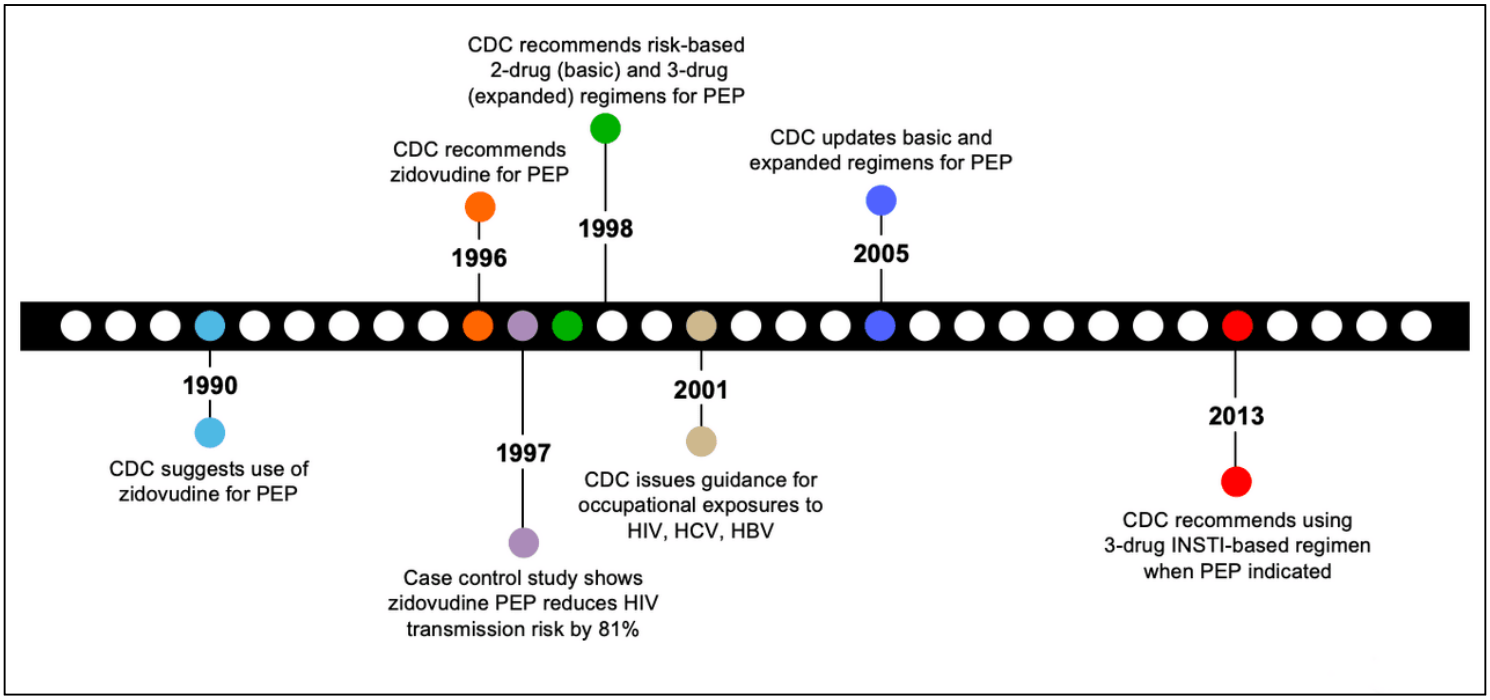

Figure 2 Confirmed Cases of Occupationally Acquired HIV in the United States, 1985-2013

Source: Joyce MP, Kuhar D, Brooks JT. Notes from the field: occupationally acquired HIV infection among health care workers - United States, 1985-2013. MMWR Morb Mortal Wkly Rep. 2015;63:1245-6.

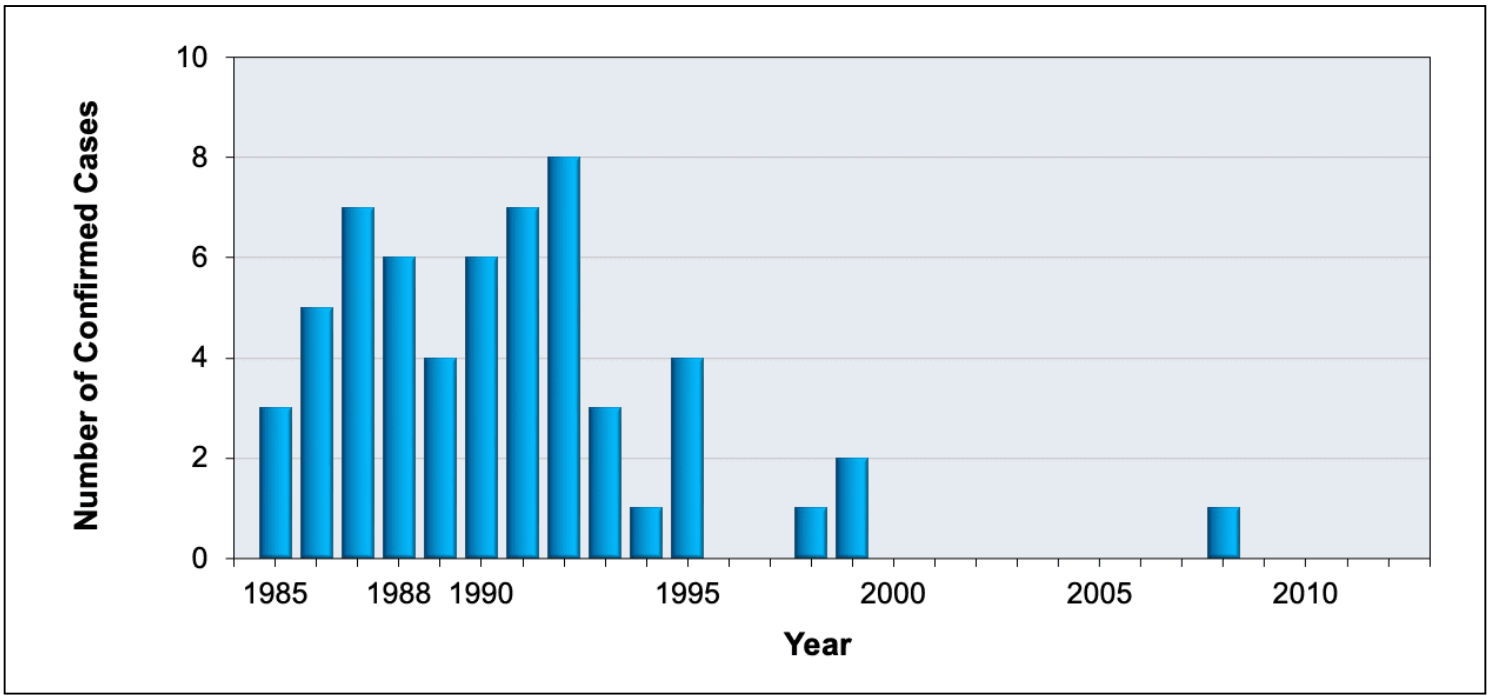

Figure 3 (Image Series) - Timing of HIV Diagnostic Tests After HIV Acquisition (Image Series) - Figure 3 (Image Series) - Timing of HIV Diagnostic Tests After HIV Acquisition
Image 3A: Timing of HIV RNA and HIV Antibodies following HIV Acquisition

Illustration by David H. Spach, MD

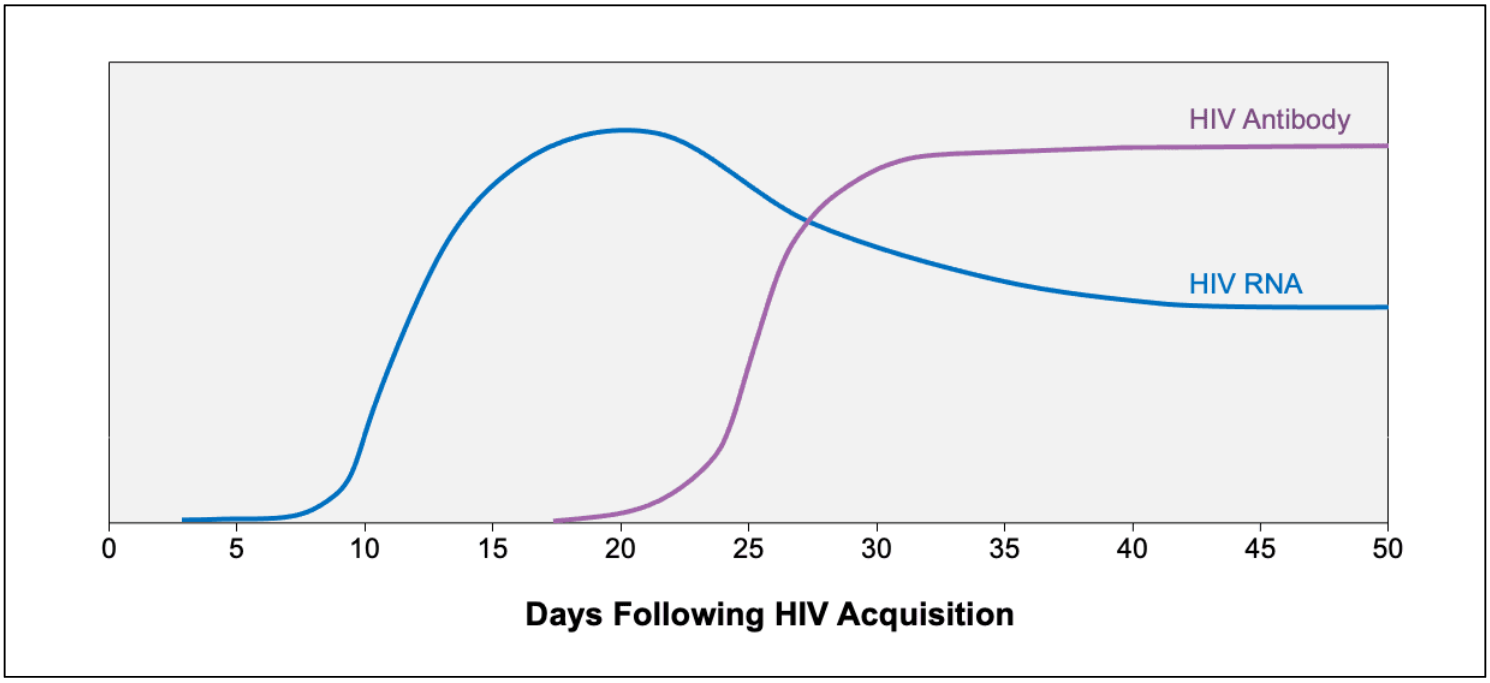

Figure 3 (Image Series) - Timing of HIV Diagnostic Tests After HIV Acquisition
Image 3B: HIV Seroconversion Window

The HIV seroconversion window period is the time between HIV acquisition and detectable antibodies against HIV.

Illustration by David H. Spach, MD

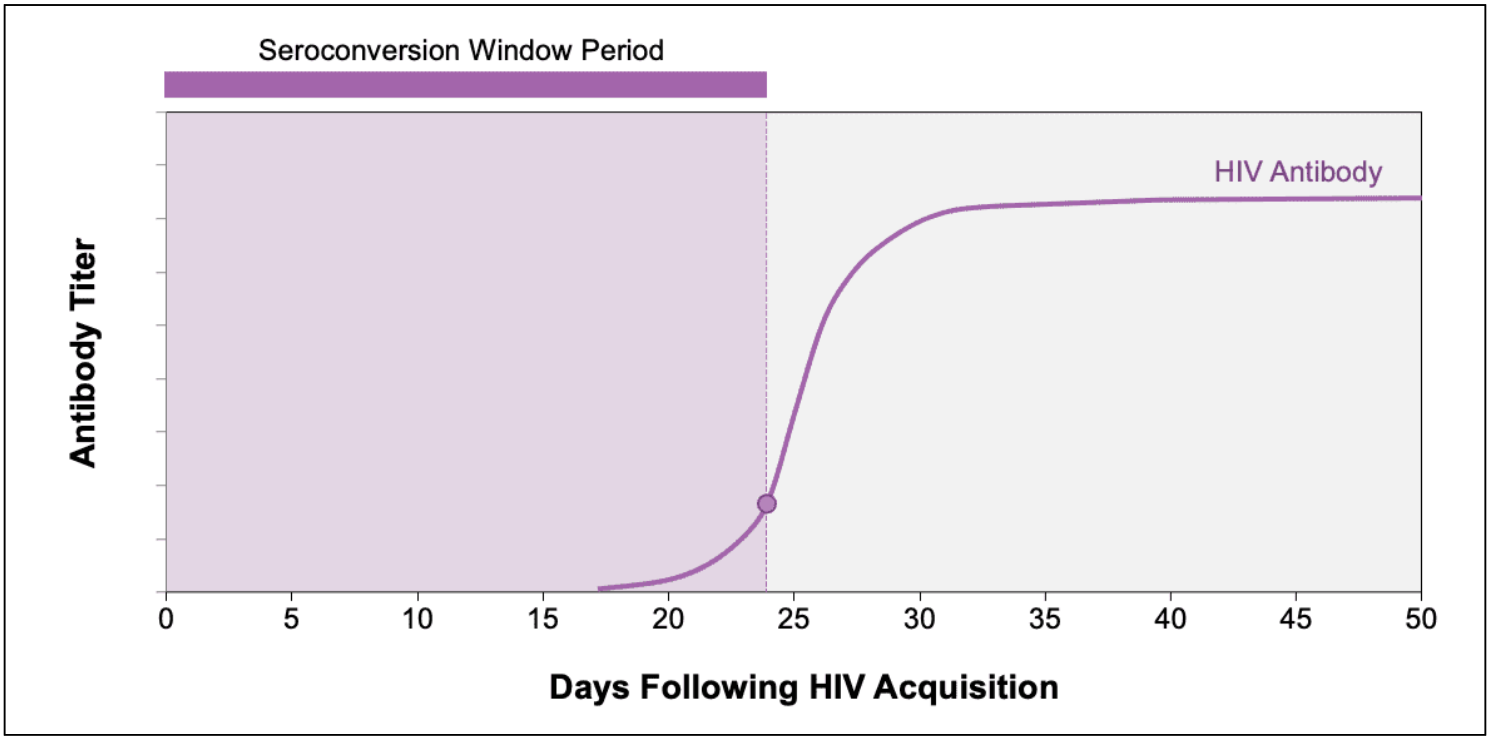

Figure 3 (Image Series) - Timing of HIV Diagnostic Tests After HIV Acquisition
Image 3C: Timing of Positivity for HIV Diagnostic Tests

This graphic shows the approximate time from HIV acquisition to test positivity.

Source: modified from Centers for Disease Control and Prevention and Association of Public Health Laboratories. Laboratory Testing for the Diagnosis of HIV Infection: Updated Recommendations. Published June 27, 2014.

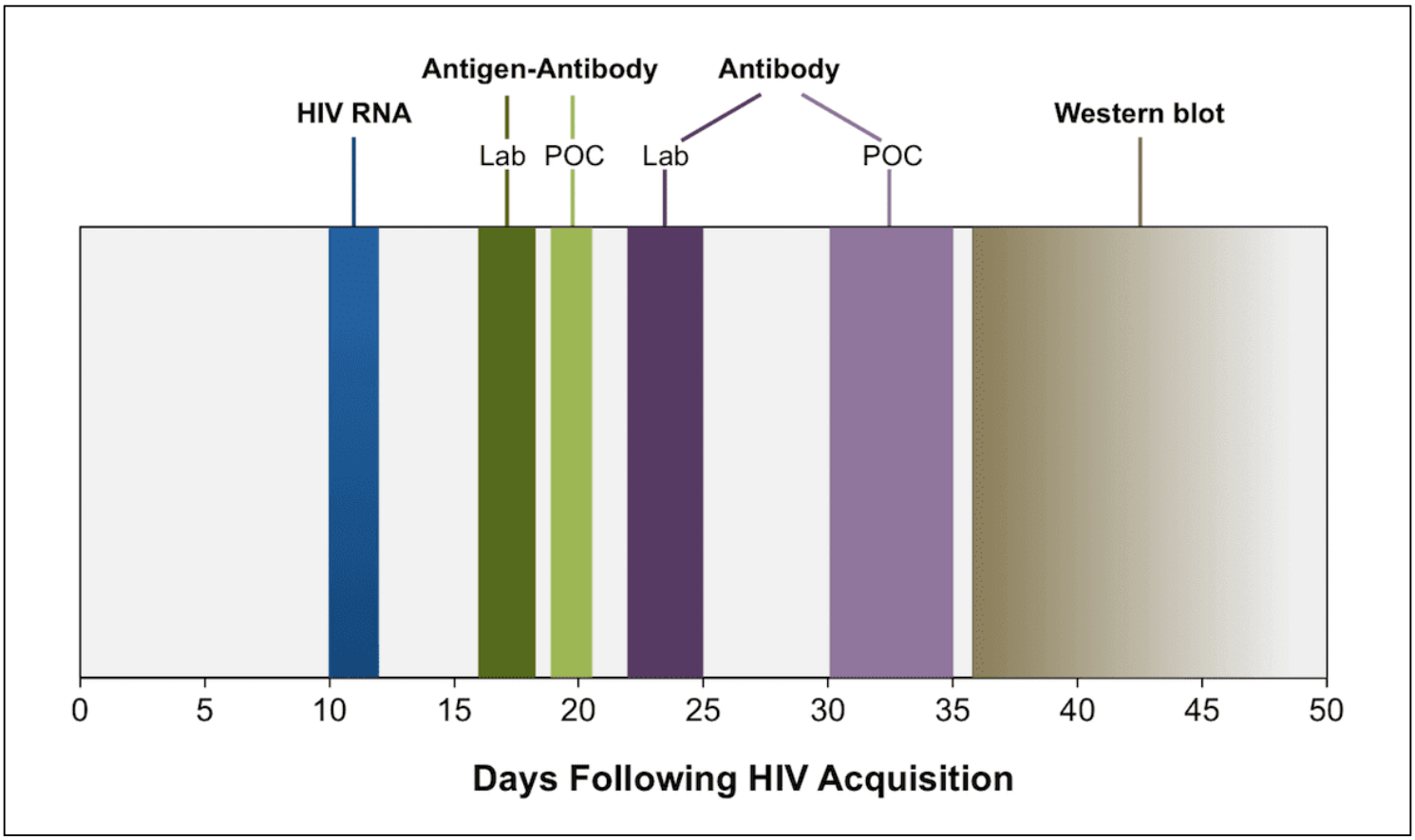

Figure 4 Relative Risk of Body Fluids Involved in Occupational Exposure to HIV

Note: although semen and vaginal secretions are known to be infectious for HIV in sexual exposures, they have not been implicated in transmissions in the occupational setting.

Source: Kuhar DT, Henderson DK, Struble KA, et al. Updated US Public Health Service Guidelines for the Management of Occupational Exposures to Human Immunodeficiency Virus and Recommendations for Postexposure Prophylaxis. Infect Control Hosp Epidemiol. 2013;34:875-92.

Relative Risk of Infectious Fluids in Occupational Exposure to HIV	
Category of Infectivity	**Fluid**
Infectious Fluids	• Blood • Visibly bloody body fluids
Potentially Infectious Body Fluids	• Semen and vaginal secretions • Cerebrospinal fluid • Synovial fluid • Pleural fluid • Peritoneal fluid • Pericardial fluid • Amniotic fluid
Not Considered Infectious (Unless Visibly Bloody)	• Saliva, vomitus, and feces • Nasal secretions and sputum • Sweat and tears • Urine

Figure 5 (Image Series) - Tenofovir PEP After SIV-1 Inoculation of Macaques (Image Series) - Figure 5 (Image Series) - Tenofovir PEP After SIV-1 Inoculation of Macaques
Image 5A: Tenofovir PEP After SIV-1 Inoculation of Macaques

Abbreviations: SIV = simian immunodeficiency virus; PEP = postexposure prophylaxis; TFV = tenofovir
In this study, investigators inoculated 24 macaques with simian immunodeficiency virus (SIV) and then instituted various postexposure prophylaxis regimens with tenofovir (PMPA), which is (R)-9-(2-phosphonylmethoxypropyl)adenine.

Source: Tsai CC, Emau P, Follis KE, et al. Effectiveness of postinoculation (R)-9-(2-phosphonylmethoxypropyl) adenine treatment for prevention of persistent simian immunodeficiency virus SIVmne infection depends critically on timing of initiation and duration of treatment. J Virol. 1998;72:4265-73.

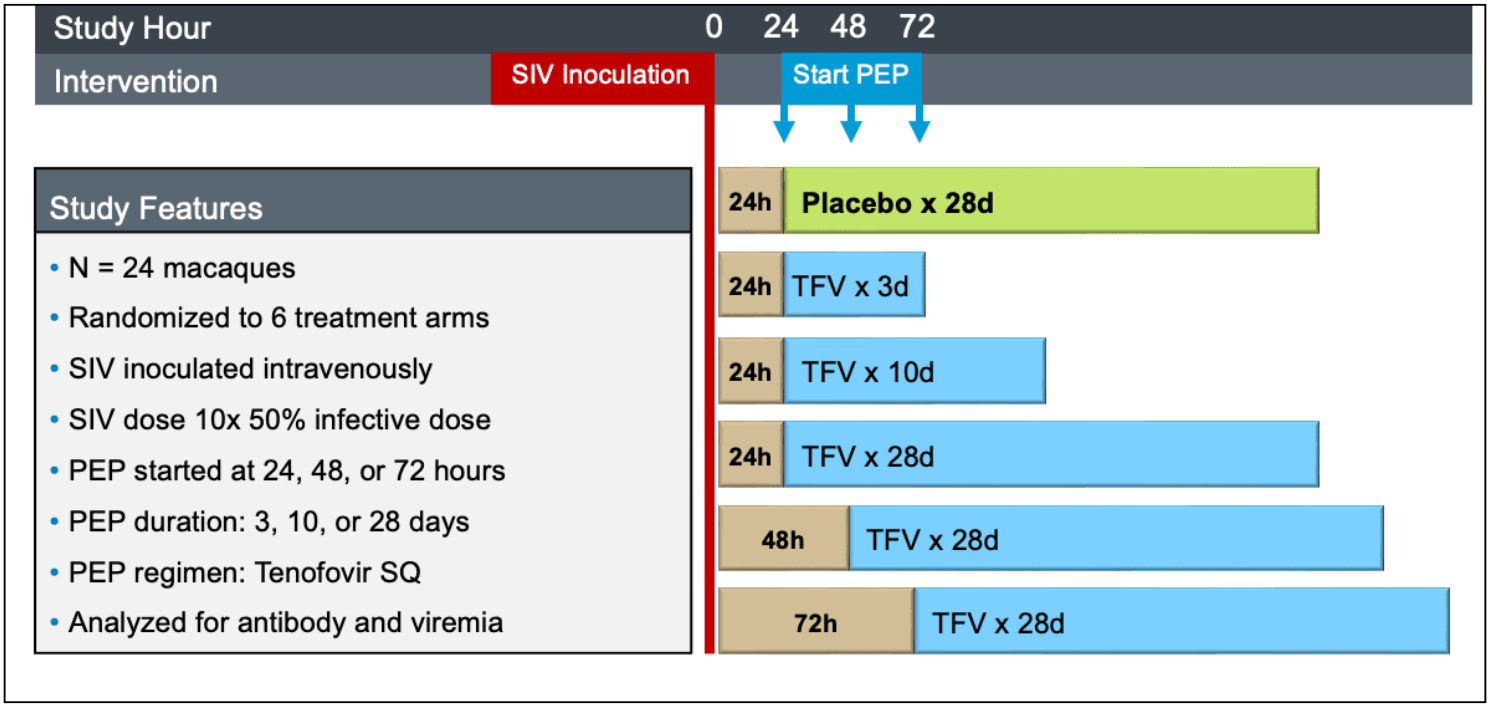

Figure 5 (Image Series) - Tenofovir PEP After SIV-1 Inoculation of Macaques
Image 5B: SIV Transmission Based on Timing of Initiation and Duration of PEP

Among animals that received placebo, all became infected with simian immunodeficiency virus (SIV). The most effective tenofovir prevention regimen consisted of early initiation of tenofovir (at 24 hours) and long duration of postexposure prophylaxis (28 days).

Source: Tsai CC, Emau P, Follis KE, et al. Effectiveness of postinoculation (R)-9-(2-phosphonylmethoxypropyl)adenine treatment for prevention of persistent simian immunodeficiency virus SIVmne infection depends critically on timing of initiation and duration of treatment. J Virol. 1998;72:4265-73.

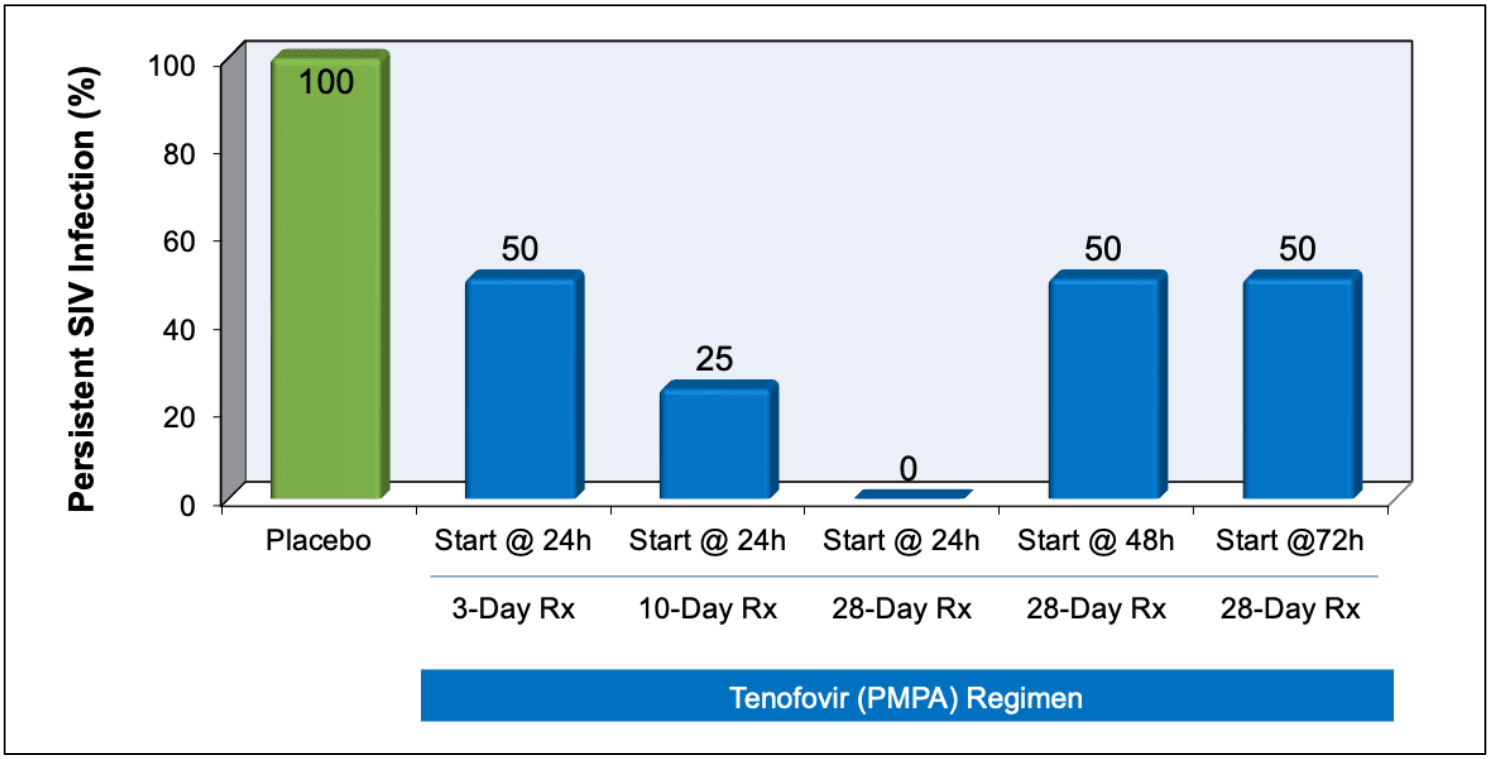

Figure 6 Initial Counseling and Laboratory Studies for Persons with Occupational Exposure to Blood or Potentially Infectious Body Fluids

Source: Kuhar DT, Henderson DK, Struble KA, et al. Updated US Public Health Service Guidelines for the Management of Occupational Exposures to Human Immunodeficiency Virus and Recommendations for Postexposure Prophylaxis. Infect Control Hosp Epidemiol. 2013;34:875-92.

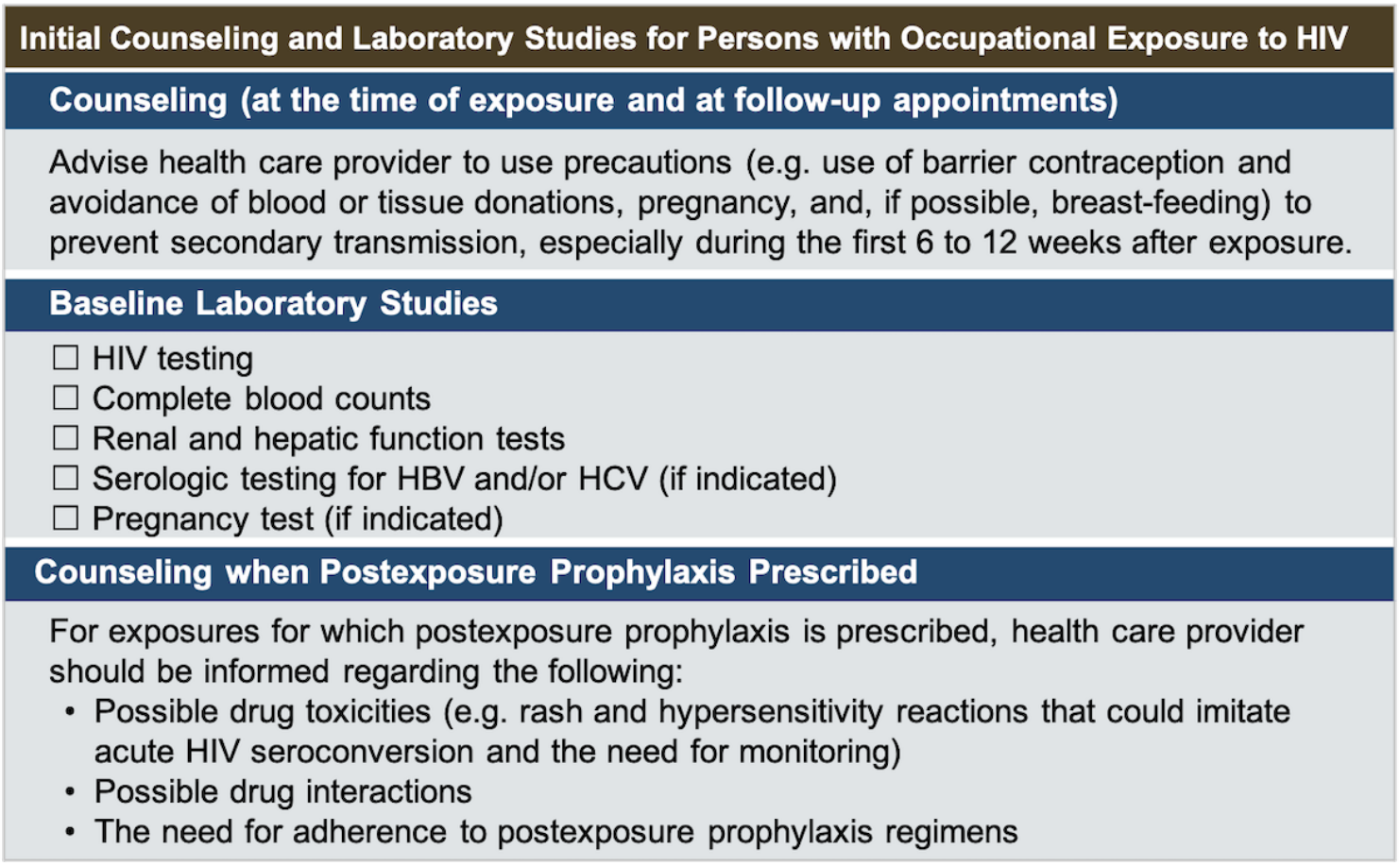

Figure 7 Follow-Up Counseling and Laboratory Studies for Persons with Occupational Exposure to HIV

Source: Kuhar DT, Henderson DK, Struble KA, et al. Updated US Public Health Service Guidelines for the Management of Occupational Exposures to Human Immunodeficiency Virus and Recommendations for Postexposure Prophylaxis. Infect Control Hosp Epidemiol. 2013;34:875-92.

Follow-Up Counseling and Monitoring for Occupational Postexposure Prophylaxis

Early Reevaluation after Exposure (within 72 hours)

Regardless of whether a health care provider is taking postexposure prophylaxis, reevaluation of exposed health care provider within 72 hours after exposure is strongly recommended, as additional information about the exposure or source person may be available.

Follow-up Testing and Appointments

Follow-up testing at a minimum should include the following:

- ☐ HIV testing at 6 weeks, 12 weeks, and 6 months after exposure; alternatively, if the clinician is certain that an HIV-1/2 antigen–antibody immunoassay is being utilized, then HIV testing could be performed at baseline, 6 weeks after exposure, and 4 months after exposure. HIV testing results should preferably be given to the exposed health care provider at face-to-face appointments.
- ☐ Complete blood counts (2 weeks after exposure; further testing may be indicated if abnormalities are detected)
- ☐ Renal and hepatic function tests (2 weeks after exposure; further testing may be indicated if abnormalities are detected)

Table 1.

Risk Factors for HIV Seroconversion in Health Care Workers

Risk Factor	Adjusted Odds Ratio
Deep Injury	15.0
Visible Blood on Device	6.2
Terminal Illness in Source Patient	5.6
Needle in Source Vein/Artery	4.3
Postexposure Prophylaxis with Zidovudine	0.19

Source:

- Cardo DM, Culver DH, Ciesielski CA, et al. A case-control study of HIV seroconversion in health care workers after percutaneous exposure. Centers for Disease Control and Prevention Needlestick Surveillance Group. N Engl J Med. 1997;337:1485-90. [PubMed Abstract]

Table 2. **USPS Guidelines for the Use of Antiretroviral Agents for Occupational Exposures to HIV**

HIV Postexposure Prophylaxis Regimens

Preferred HIV Postexposure Prophylaxis Regimen
• Raltegravir (400 mg twice daily) plus Tenofovir DF-Emtricitabine (300 mg-200 mg [1 tablet] daily)

Alternative HIV Postexposure Prophylaxis Regimens

May combine 1 anchor drug or drug pair from the left column with 1 pair of nucleoside/nucleotide reverse transcript from the right column; prescribers unfamiliar with these agents/regimens should consult clinicians who are familiar agents and their toxicities[a]

Anchor Drug	**Nucleoside Reverse Transcriptase Inhibitors**
• Raltegravir • Darunavir + ritonavir • Etravirine • Rilpivirine • Atazanavir + ritonavir • Lopinavir-ritonavir	• Tenofovir DF-emtricitabine • Tenofovir DF + lamivudine • Zidovudine-lamivudine • Zidovudine + emtricitabine

The following alternative is a complete fixed-dose combination regimen, and no additional antiretroviral medication Elvitegravir-cobicistat-tenofovir DF-emtricitabine

Alternative Agents for Use as PEP Only with Expert Consultation	**Agents Generally Not Recommended for Use as PEP**	**Agents Contraindicate PEP**
• Abacavir • Efavirenz • Enfuvirtide • Fosamprenavir • Maraviroc • Saquinavir • Stavudine	• Didanosine • Nelfinavir • Tipranavir	• Nevirapine

Note. For consultation or assistance with HIV PEP, contact the National Clinician Consultation Center's Post-Exposur Hotline at telephone number 888-448-4911 or visit its website at http://nccc.ucsf.edu/

[a]The alternatives regimens are listed in order of preference; however, other alternatives may be reasonable based and clinician preference.

Source:

- Kuhar DT, Henderson DK, Struble KA, et al. Updated US Public Health Service Guidelines for the Management of Occupational Exposures to Human Immunodeficiency Virus and Recommendations for Postexposure Prophylaxis. Infect Control Hosp Epidemiol. 2013;34:875-92. [PubMed Abstract]