# Management of Occupational Exposure to HIV in Dental Health Care Workers

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#### Abstract:

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reduce the risk of transmission. The PEP protocol consists of report of needle sticks injury,

prescription of two or three antiretroviral agents in the first 48 hours after exposure, and

antibody testing of HCW for seroconversion up to six month. Health care workers have to

Health care workers (HCW) are at high risk of occupational exposure from blood-borne pathogens. The most important pathogens that can be transmitted to HCW are HIV with prevalence of 2.24 per 100000, HBV with prevalence of 2.3%, and HCV with prevalence of 0.2% in Iran. Most of this occupational transmission can be prevented through standard precautions reducing exposure. These precautions, however, have not been able to obviate the problem due to the risk of infection through accidental exposure. Risk of HIV infection in these cases has been estimated to be 0.2-0.3 percent for parenteral exposure. If an accidental exposure occurs, there are some post-exposure prophylaxis (PEP) protocols that

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be educated about PEP and each institution needs to adopt a clear protocol.

## **INTRODUCTION**

One of the foremost professional dangers among health care worker (HCW) is occupational exposure to blood born pathogens. Over 20 pathogens that have been transmitted to HCW via a needle stick injury [1]. One of the important infections in this category is HIV, which great concerns exist about its epidemic. WHO estimated that 40 million adults and 2.7 million children lived with HIV at the end of 2001 [2], and the incidence of the disease is increasing especially in the developing countries [1-4].

In 1984 the first report of a HCW occupational exposure through needle stick, which resulted

to HIV infection by, was published in the medical literature [5] and increased the apprehension about the occupational transmission of blood-borne pathogens (BBP).

Although loyalty to universal precautions and habitual use of appropriate barriers provide protection against most microorganisms, HCW are still at risk of infection from blood borne pathogens due to unintentional exposures. This risk has been estimated to be 0.2-0.3 percent for parenteral exposure [6-9]. Because of precarious or sub optimal practice and unfettered discarding of risky waste [10-14], this danger is higher in developing countries. Moreover, records and reports of infection caused by oc-

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cupational exposure in these countries are limited [15-16], and the awareness about post exposure prophylaxis (PEP) among HCW is poor [17,18].

Compared to many other health care settings, in the dental workplace sharp and needle stick injuries have higher incidence due to small operating field, frequent patient movement and the use of a variety of sharp dental instruments in every day practice [3,4].

Thus, amplifying the knowledge about PEP is a must. A culture of confidentiality, ignorance, blame, and disgrace creates a non-supportive ambiance causing staff collapse. However, if HCWs feel that they can protect themselves from infection they can represent better care [19].

Table 1.	CDC	recommendations	for	PEP	
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<b>Recommended Antiretroviral Regimens</b>			
Basic Regimen:			
Zidovudine 600 mg/day in 2 or 3 divided doses plus			
Lamivudine (3TC) 150 mg bid			
or			
Combivir 1 po bid			
Fynanded Regimen.			
Basic Regimen			
plus			
Indinavir (IDV) 800 mg q8h or			
Nelfinavir 750 mg q8h or 1250 mg bid or			
Efavirenz 600 mg every 6 hours			

#### **Duration of PEP:**

Abacavir 300 mg bid

4 weeks

#### HIV Antibody Testing of Healthcare Worker Baseline

1 month post-exposure 3 months post-exposure 6 months post-exposure

#### **Initiation of PEP**

Occupational exposure should be regarded as an urgent medical concern, and PEP should be started as soon as possible after the exposure. For highest risk exposures, PEP may be initiated up to 1 to 2 weeks post-exposure.

### **Risk of Occupational Transmission**

The risk of HIV seroconversion subsequent to the occupational blood exposure has been estimated to be 0.2-0.3 percent for parenteral exposure, and 0.1 percent or less for mucosal exposure [6-9,20]. The factors that control this risk are not well understood but previous studies have revealed that it is considerably associated with following factors: prevalence of infection in the population, frequency of activities capable of transmitting the infectious virus, nature and efficiency of exposure (needle sticks vs. mucosal exposure), and existence of infection control policy before and after of an exposure [6,21].

Although standard precautions about bloodborne pathosis is in attendance and followed, there are more than 100,000 needle stick injuries reported in UK hospital each year [22]. Thus, availability and efficacy of the post exposure protocol for blood born pathosis is an important factor.

Whereas there is no assurance that PEP works, a case control study conducted by the USCDC revealed that the administration of zidovudine prophylaxis to HCW exposed to HIV was associate with an 80 percent decrease in the risk for occupationally acquired contamination [23]. Since 1988, a small number of hospitals in United State, like Bethesda MD, have started to recommend zidovudine to HCW after an occupational exposure to HIV [24]. At present PEP after occupational exposure is available, promoted and extensively prescribed in European countries as well as in the USA and Canada [25].

To review available PEP regimens for HIV infection and their considerations, a literature review was conducted to identify published case reports of occupationally acquired HIV infection among HCW. The key terms used for search were HIV, AIDS, occupational infection, occupational exposure, occupational disease, HCW, needle stick, and post-exposure prophylaxis.

PEP=Post-Exposure Prophylaxis,

The databases searched were Pub Med from 1981 to 2006, and international health meetings held during the last 10 years. We checked the reference lists of identified articles and reviews to recognize other applicable articles. We selected the following documents as our references: observational systems of occupational exposures to blood borne pathogens, case reports of occupational infection among HCW, and research about occupational health and HCW. HCW was defined as personnel, as well as students and trainees, who were working in health care, clinical, or laboratory areas.

#### **Definition of Exposure**

Comprehensive explanation of exposure is necessary to evaluate the opportunity of BBP transmission. Occupational Safety and Health Administration (OSHA) blood born pathogens standard (29 CFR 1910. 1030) [26] and CDC guideline [27] state "occupational exposure" to blood, tissue or other possible infectious items such as semen; vaginal secretions; and cere-

Table	2.	NYSDOH	recommendations	for	PEP.

**Recommended Antiretroviral Regimen** 

Zidovudine (ZDV) 300 mg bid **plus** Lamivudine (3TC) 150 mg bid **or** Combivir 1 po bid

plus

Tenofovir 300 mg po qd

#### **Duration of PEP:**

4 weeks

## HIV Antibody Testing of Healthcare Worker

Baseline 1 month post-exposure 3 months post-exposure 6 months post-exposure

#### **Initiation of PEP**

PEP should be promptly initiated ideally within 2 hours and no later than 36 hours after the exposure to optimize effectiveness.

PEP=Post-Exposure Prophylaxis, NYSDOH= New York state department of health brospinal, pleural, peritoneal, pericardial, synovial, and amniotic fluids have a possible spread hazard of BBP to health workers. Thus post-exposure prophylaxis ought to be considered if any of the following events occur: a percutaneous injury (needle stick, cut with sharp object); wound inducing bite from an HIV-infected patient with detectable bleeding in the mouth; contact with mucous membrane or non-intact skin like skin abraded, dermatitis or open wound; splatter of infectious material to eye, mouth or noise; and prolonged contact with intact skin [28].

Contact with saliva, tears, sweat, and nonbloody urine or feces dose not transmit infection and no PEP is necessary in this case. The factors, which are vital at the time of exposure are: depth of damage; visible blood on the device; way of using needle (for example in vain or artery); type of needle (solid or hollow) history of patient; length of exposure; and usage of personal protective equipment [28].

#### After Exposure Guideline

The following processes are recommended almost immediately after exposure occurs:

#### **Step 1: Management of the Exposed Site**

The site of exposure should be washed with soap and water. Mucous membranes like eye or mouth should be rinsed with water. There is no proof that the use of antiseptics for wound care decreases the risk for HIV transmission. Thus, use of antiseptics into the wound is not recommended 27].

#### **Step 2: Records of Exposure**

The data of exposure must be documented by a member of occupational exposure committee or a skilled medical worker. The following data that must be recorded: name and data of HCW (including prior testing and Immune status) and name/data of source if known; time and records of exposure (conditions of exposure); category of exposure (precutaneous, mucosal, non-intact skin); body site exposed and contact time; infective status of the source if obtainable; and description of percutaneous wound (depth, type of device, bleeding or not) [15].

### **Step 3: Testing of the Source**

Testing of the source for HIV, HBV, and HCV should be done as soon as achievable if the source is recognized, and his/her infective status has not been recognized already. Rapid testing is suggested [29]. If the test result is not immediately available, the initiation of preventive regimen should not be postponed. If the result of source test is negative, the HCW should be educated of the small possibility that it could be a false negative result due to window period of the source patient.

### **Step 4: Beginning of PEP Regimens**

Perfectly PEP regimens should be initiated within two hours after exposure.

#### **Post Exposure Protocol of HIV Infection**

The definitive goal of PEP is to suppress any limited viral duplication that may arise. The systemic infection typically does not happen immediately and this delay make a potential time in which antiviral treatment may alter viral reproduction. We cannot always generalize the results of animal studies to human [27], but these studies have shown that early initiation of PEP associate with successful prophylaxis. In a retrospective case-control research among HCWs, the risk of HIV infection reduced by 81 percent in individuals who used zidovudine [30].

### **PEP Regimen**

along with the some antiretroviral agents accessible from at least three classes of drugs, i.e. nucleoside analogue reverse transcriptase inhibitors (NRTI), non-nucleoside reverse transcriptase inhibitors (NNRTI), and protease inhibitor (P1), zidovudine has been demon-

Drug	Dose	Common side effects / comments		
Zidovudine	300 mg twice a day	Initial nausea, anemia, neutropenia, myopathy		
Lamivudine	150 mg twice a day	Generally well tolerated		
Stavudine	40 mg twice a day for > 60 kg BW 30 mg twice a day for > 60 kg BW	Peripheral neuropathy. Should not be co adminis- tered with zidovudine		
Indinavir sulphate	800 mg three times a day on empty sto- mach or with snack containing <2 g of fat	Kidney stones, occasional nausea, abdominal pain, and gastrointestinal upset. Store in original containe which contains desiccant, without this, indinavir is stable for only about three days.		
Efavirenz	600 mg once daily	Rash (including Steven-Johnson, insomnia, dizzi- ness, and abnormal dreaming)		
Tenofovir	300 mg qd	Asthenia, headache, diarrhea, nausea, vomiting.		
Nelfinavir	750 mg three times daily, with a meal or snack, or 1250 mg twice daily with meal or snack.	Rash (including Stevens-Johnson) insomnia, dizzi- ness. Trouble in concentration, abnormal dreaming.		
Abacavir	300 mg twice daily	Nausea, diarrhea, anorexia, abdominal pain, fatigue, insomnia		

Table 3. Common side effects of drugs given in PEP regimen for HIV.

PEP=Post-Exposure Prophylaxis

strated to prevent transmission of HIV in humans [30,31]. Therefore, all post-exposure prophylaxis regimens suggest zidovudine as the first medicine [32]. This regimen is recommended by CDC [32]. This center presently recommends two types of regimens: a basic two-drug regimen (zidovudin/lamivudine), and an expanded three-drug regimen that should be used for exposure that pose an increased risk of transmission (Table 1).

There are no information supporting addition of other drugs in PEP, but some studies demonstrate that HIV infected patients show superior result to combination regimens than mono therapy [33,34]. Therefore, hypothetically use of a combination of drugs, which act at dissimilar phases in the viral duplication cycle may propose an additive protective result in PEP.

Based on the superior antiretroviral activity of a zidovudine-lamivudine combination [35], the second drug that is recommended in this regimen is lamivudine. The addition of a third drug, which typically is a protease inhibitor, ought to be considered for exposures that pretense an increased risk for transmission [32]. Indinavir has been chosen as the third drug because of its increased bioavailability and better toxicity report [32]. If cost of treatment is a matter, Efavirenz might be considered for expanded regimens, although its side effect might be higher than other drugs [32].

AIDS institute of the New York state department of health (NYSDOH) supports a more forceful approach to block HIV infection after occupational exposure [36]. They recommend

**Table 4.** PEP drugs that should be avoid during pregnancy

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Drug (s) to be avoided	Toxicity
Efavirenz	Teratogenicity
Combination of stavu- dine and didanosine	Mitochondrial toxicity
Unboosted IDV in the 2nd or 3rd trimester	Substantially lower ante par- tum indinavir plasma concen- trations

PEP=Post-Exposure Prophylaxis, IDV= Indinavir sulphate

HAART (Highly Active Antiretroviral Therapy) regimen, which usually consist of two nucleoside agents and a protease inhibitor or nonnucleoside reverse transcriptase inhibitor (Table 2).

## **Timing for PEP**

The initiation of PEP should be almost immediately after exposure, preferably within 2 hours and no later than 36 hours after contact [37]. Animal studies suggest that PEP is significantly less effective when started more than 26-36 hours after exposure [38-42]. The beginning of treatment should not be delayed awaiting the test result.

Unfortunately, the doubts may confuse the decision making route and delay immediate initiation of PEP. This postponement dissipates biologic advantage of the host cellular immune system and increase the possibility of infection.

All HCWs taking the PEP regimen should be reassess after 72 hours of their exposure [36]. Analysis of serology of source patient if available should be obtained. The toxicities associated with the PEP regimen should also be considered. The optimal duration of PEP is unknown but four weeks is the general recommendation. Drug toxicity monitoring should be performed at baseline and repeated two weeks after starting the PEP. Table 3 lists the frequent side effects. Testing should include total and differential blood count, renal function test (for patients receiving Indinavir), and liver function test. Blood glucose should be monitored if a protease inhibitor is included in the regimen. If toxicity is noted, adjustment of the regimen should be considered.

## **PEP during Pregnancy**

Knowledge about the effects of antiretroviral medicine on the developing fetus or neonate is incomplete [4,36].

Drugs to avoid during pregnancy are listed in Table 4. Use of any antiretroviral medicine in

the duration of pregnancy should be discussed between the woman and her health care provider and the possible benefits and dangers to the fetus should be considered.

Efavirenz is not recommended during pregnancy because neural tube defects related to its use in human fetus have been reported [36]. The fatal lactic acidosis in pregnant woman treated with a combination of Stavudine and Didonosine have provoked warning about taking these drugs during pregnancy. Indinavir increase the risk of hyper bilirubinaemia in new borns and should not be administered shortly before delivery. Breast feeding is not recommended for 6 months after exposure to HIV.

#### Assessment of HCW for Seroconversion

If the HIV test of the source patient is positive, the evaluation of seroconvertion of HCW should be done through lab test at baseline and follow up at six weeks, three months and six months after exposure [36,43].

If infection occurs, in 95 percent of the cases, seroconversion occurs within six months after the exposure [27]. HCW should directly check to detect any drug toxicities. Around 50 percent of HCWs who initiate PEP do not complete therapy due to side effects or lack of monitoring [36].

#### CONCLUSION

Although avoiding blood exposures is the principal means of preventing occupationally acquired blood-borne diseases, suitable post exposure management is an important part of work place safety. It is necessary to evaluate, investigate and report the accidental exposure and follow up the victim HCWs.

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