

**Guidelines for the  
Management of Occupational  
Exposures to HBV, HCV, and HIV  
and Recommendations for  
Postexposure Prophylaxis**

# Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), and Human Immunodeficiency Virus (HIV)

- Bloodborne viruses
- Can produce chronic infection
- Transmissible in healthcare settings

# Preventing Transmission of Bloodborne Viruses in Healthcare Settings

- Promote hepatitis B vaccination
- Treat all patients as potentially infectious
- Use barriers to prevent blood/body fluid contact
- Prevent percutaneous injuries

# Preventing Percutaneous Injuries

- **Eliminating unnecessary needle use**
- **Using devices with safety features**
- **Developing safe work practices for handling needles  
and other sharp devices**
- **Safely disposing of sharps and blood-contaminated  
materials**

# Factors Influencing Occupational Risk of Bloodborne Virus Infection

- Prevalence of infection among patients
- Type of exposure and type of virus
- Nature and frequency of blood exposures

# Prevalence of Bloodborne Virus Infection in Patients

- Generally higher in hospitalized patients than general population
- Varies with geographic area
- Varies with patient risk factors (injecting drug use, multiple sex partners)

# Risk of HBV, HCV and HIV Transmission after Occupational Percutaneous Exposure

- HBV risk varies depending on e-antigen status of source person
  - If e-antigen positive, risk is up to 30%
  - If e-antigen negative, risk is 1-6%
- HCV risk is 1.8% (range of 0 - 7%)
- HIV risk is 0.3% (range of 0.2 - 0.5%)

# Frequency of Percutaneous Injury in US Healthcare Personnel

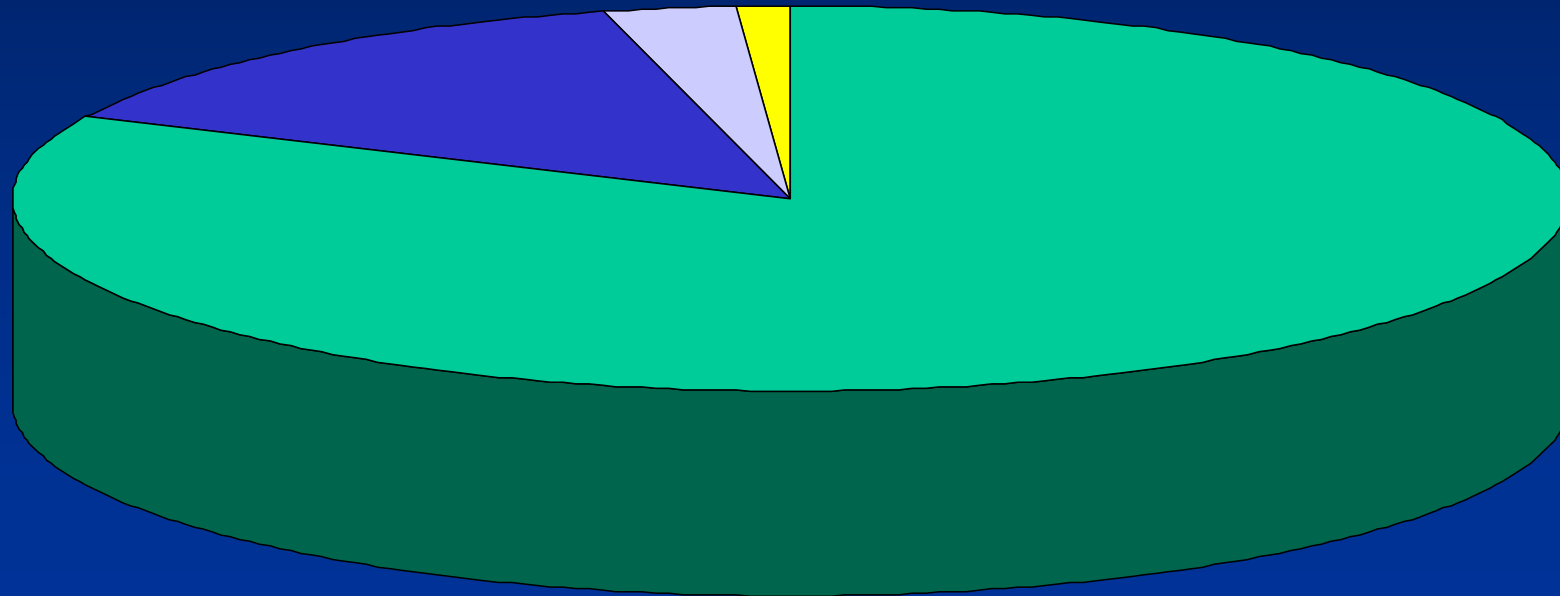
- 384,325 annually (about 1000 per day) percutaneous injuries are sustained by healthcare personnel in US hospitals\*
- The number of injuries sustained outside of hospital settings is unknown
- Frequency of percutaneous injury varies by occupation and healthcare setting

\* Panlilio, AL, et. al. Estimate of the Annual Number of Percutaneous Injuries in U.S. Healthcare Workers. 4th Decennial Conference, March 5-9, 2000

# Exposure Types for Blood/Body Fluid Exposures\* June 1995-December 2000

(n=12,678)

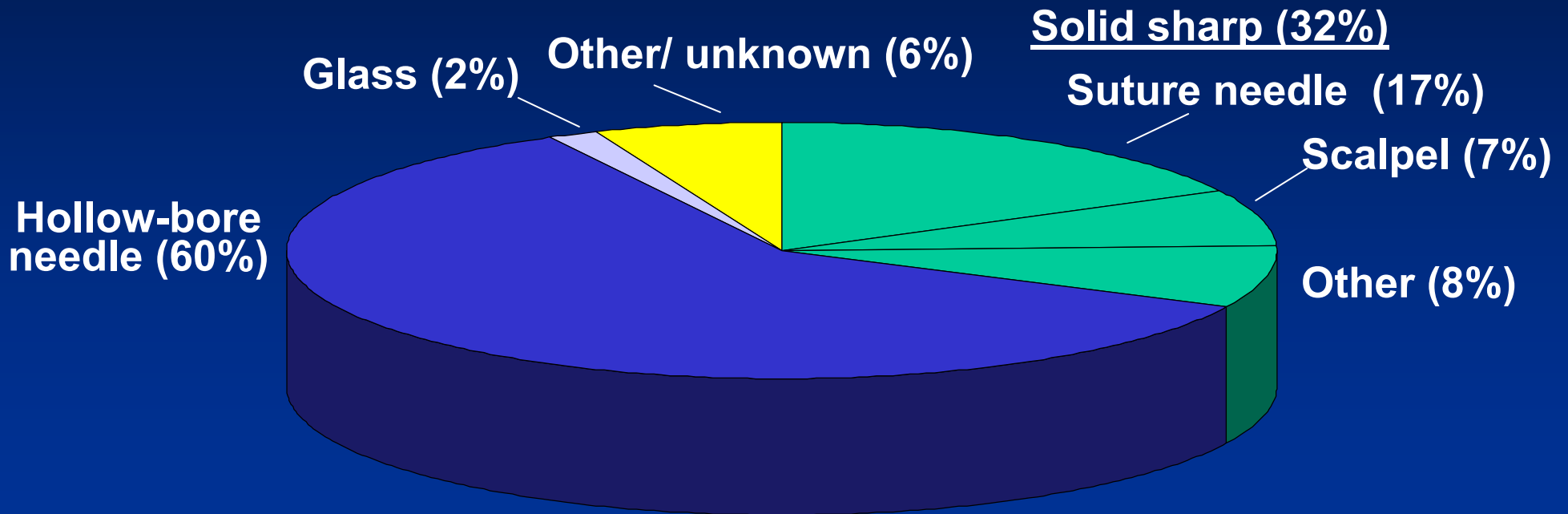
Mucous membrane	Non-intact skin	Bite	Percutaneous
1817 (14%)	352 (3%)	131 (1%)	10,378 (82%)



# Device Types for Percutaneous Injuries

June 1995-December 2000

(n=10,378)



# Postexposure Management

- Clear policies/procedures
  - Confidentiality of exposed and source persons
  - Management of exposures
  - Posted in visible place
- Training of healthcare personnel
- Rapid access to
  - clinical care
  - postexposure prophylaxis (PEP)
  - testing of source patients/exposed persons
- Injury prevention assessment

# Elements of Postexposure Management

- Wound management
- Exposure reporting
- Assessment of infection risk
  - type and severity of exposure
  - bloodborne infection status of source person
- Appropriate treatment, follow-up, and counseling

# Postexposure Management: Wound Care

- Clean wounds with soap and water
- Flush mucous membranes with water
- No evidence of benefit for:
  - application of antiseptics or disinfectants
  - squeezing (“milking”) puncture sites
- Avoid use of bleach and other agents

# Postexposure Management: The Exposure Report

- Date and time of exposure
- Procedure details...what, where, how, with what device
- Exposure details...route, body substance involved, volume/duration of contact
- Information about source person and exposed person

# Postexposure Management: Assessment of Infection Risk

- **Type of exposure**
  - percutaneous
  - mucous membrane
  - non-intact skin
  - bites resulting in blood exposure
- **Body substance**
  - blood
  - bloody fluid
  - Semen, vaginal secretions, CSF, pleural, peritoneal, pericardial, amniotic

# Postexposure Management: Assessment of Infection Risk

- **Source person**
  - presence of HBsAg
  - presence of HCV antibody
  - presence of HIV antibody

# Postexposure Management: Unknown or Untestable Source

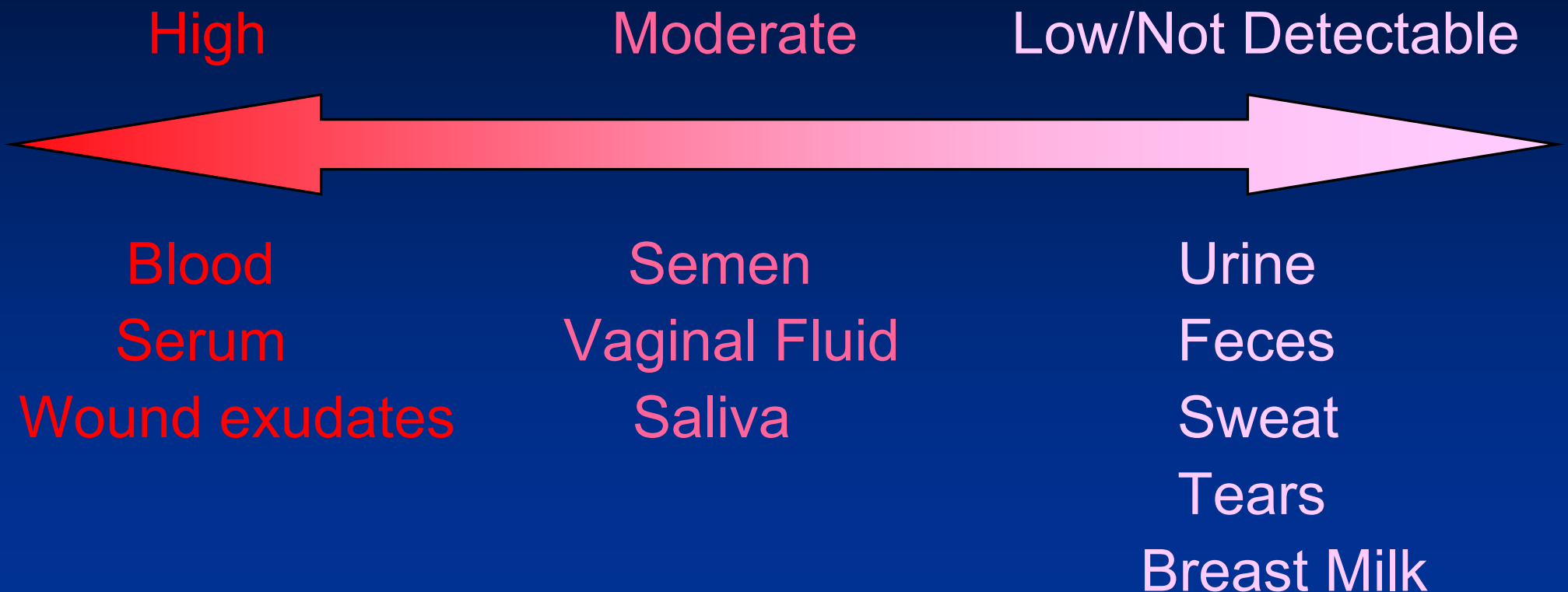
- Consider information about exposure
  - where and under what circumstances
  - prevalence of HBV, HCV, or HIV in the population group
- Testing of needles and other sharp instruments  
**NOT RECOMMENDED**
  - unknown reliability and interpretation of findings
  - hazard of handling sharp instrument

# Postexposure Management: Evaluating the Source

- Informed consent should be obtained in accordance with state and local laws
- Confidentiality of the source person

# Occupational HBV Exposures

# Concentration of HBV in Body Fluids



# Elements of Postexposure Management: HBV

- Baseline evaluation and testing of exposed person with unknown HBV immune status
- Consideration of treatment
  - when to give
  - what to give
- Follow-up testing and counseling

# Postexposure Management: Baseline HBV Testing of Exposed\* Person

- Test for anti-HBs if person has been vaccinated, but vaccine response is unknown
- Baseline testing not necessary if vaccine response is known
- If exposed person has been vaccinated and is a known responder to the vaccine, no PEP is necessary

# Recommended Postexposure Management: PEP for Exposure to HBV

## Unvaccinated

HBIG x 1 and initiate hepatitis B vaccine series

## Previously vaccinated Antibody response unknown

Test exposed person for anti-HBs

1. If adequate, no treatment
2. If inadequate, HBIG x 1 and vaccine booster



# Side Effects of Hepatitis B Vaccine

- Pain at injection site
- Mild to moderate fever
- Anaphylaxis in an estimated 1 in 600,000 doses given
- No serious adverse events detected through surveillance
- No risk of adverse effects to fetus

# Efficacy of HBV PEP\*

## Regimen

## Prevention of HBV Infection

Multiple doses of HBIG  
alone when 1st dose  
initiated within 1 week

70-75%

Hepatitis B vaccine series  
alone

70-75%

Combination of HBIG and  
vaccine series

85-95%

# Hepatitis B Vaccine: Long-Term Efficacy

- Anti-HBs titers decline to  $<10$  mIU/mL in 30-50% of adults within 8-10 years after vaccination
- Exposure to HBV results in anamnestic anti-HBs response that prevents clinically significant HBV infection
- Immune memory remains intact for at least 20 years after immunization
- Chronic HBV infection rarely documented among vaccine responders
- **Booster doses currently not recommended**

# Postexposure Management: Follow-up HBV Testing of Exposed Person

- Perform follow-up anti-HBs testing in healthcare personnel who receive hepatitis B vaccine
  - test for anti-HBs 1-2 months after last dose
  - anti-HBs response to vaccine cannot be ascertained if HBIG received in the previous 3-4 months

# Postexposure Management: HBV Postexposure Counseling

- Refrain from donating blood, plasma, organs, tissue, or semen.
- No need for:
  - modification of sexual practices or refraining from becoming pregnant or breastfeeding
  - modification to patient care responsibilities for exposed person
- If acute HBV infection, evaluate according to published recommendations

# Occupational HCV Exposures

# Occupational Transmission of HCV

- Inefficiently transmitted by occupational exposures
- Average incidence 1.8% (range 0-7%) following percutaneous exposure from HCV-positive source
- Case reports of transmission from blood splash to mucous membrane
- Prevalence 1-2% among healthcare personnel
  - Lower than among adults in the general population
  - 10 times lower than for HBV infection

# Elements of Postexposure Management: HCV

- Baseline evaluation and testing
- Follow-up testing and counseling
- PEP Not recommended after exposure
  - immunoglobulin not effective
  - no data on use of antivirals (e.g., interferon), and may be effective only with established infection
  - antivirals not FDA approved for this setting

# Postexposure Management: Baseline HCV Testing of Exposed Person

- If HCV-positive source, test exposed person for anti-HCV and ALT
- If source not infected, baseline testing not necessary

# Postexposure Management: HCV Postexposure Counseling

- Refrain from donating blood, plasma, organs, tissue, or semen.
- No need for:
  - modification of sexual practices or refraining from becoming pregnant
  - special precautions to prevent secondary transmission.
  - modification to patient care responsibilities for exposed person, even if HCV infected

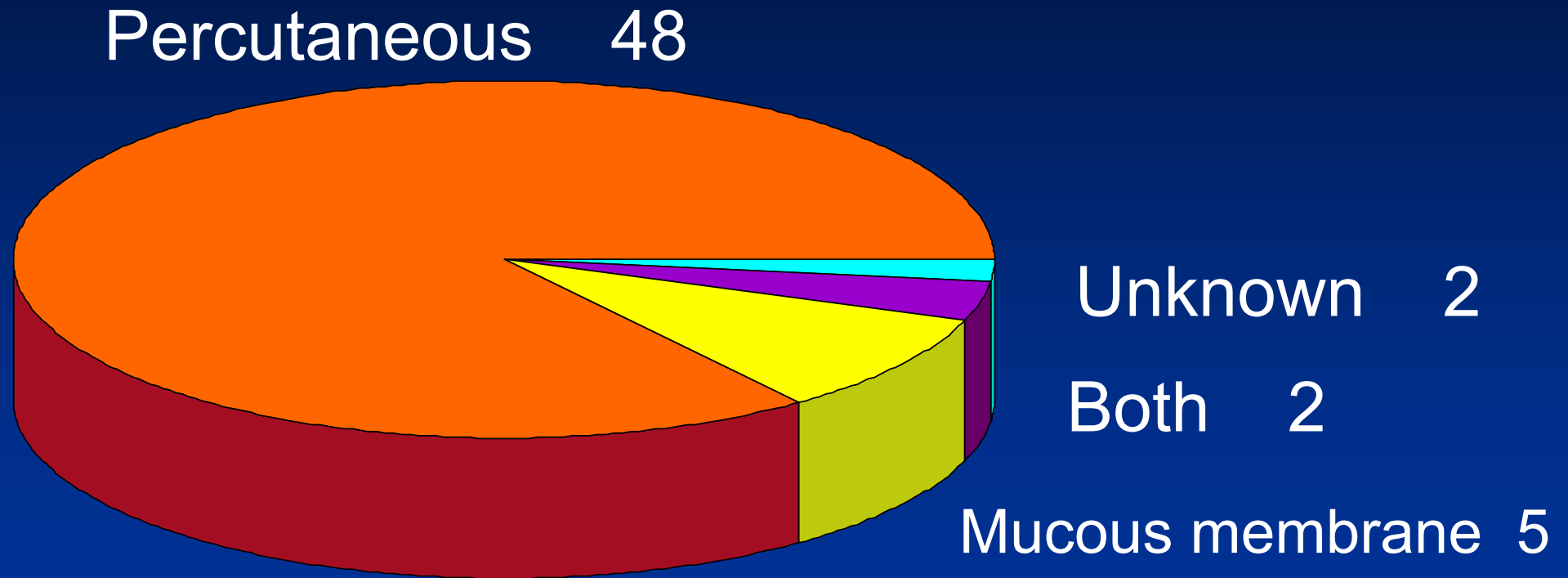
# Occupational HIV Exposures

# Occupations of US Healthcare Personnel with Documented/Possible Occupational AIDS/HIV Infection

Occupation	Documented	Possible
	Transmission (No.)	Transmission ( No.)
Nurse	24	34
Laboratory technician, clinical	16	17
Physician, nonsurgical	6	12
Health aide/attendant	1	15
Housekeeper/maintenance worker	2	13
Emergency medical technician/paramedic	----	12
Dental worker, including dentist	----	6
Laboratory technician, nonclinical	3	----
Physician , surgical	----	6
Respiratory therapist	1	2
Embalmer/morgue technician	1	2
Technician, dialysis	1	3
Technician, surgical	2	2
Technician/therapist, other than above	----	9
Other healthcare occupations	----	4
<b>Total</b>	<b>57</b>	<b>137</b>



# Details of the 57 Exposures Resulting in Occupational HIV Transmission



# Average Risk of HIV Infection to Healthcare Personnel by Exposure Route

- Percutaneous 0.3%
- Mucous membrane 0.09%
- Non-intact skin <0.1%

# Risk Factors for HIV Transmission After Percutaneous Exposure to HIV-Infected Blood:

<u>Risk Factor</u>	<u>Adjusted Odds ratio (95% CI)</u>	
Deep injury	15	(6.0-41)
Visible blood on device	6.2	(2.2-21)
Procedure involving needle placed in artery or vein	4.3	(1.7-12)
Terminal illness in source patient	5.6	(2.0-16)
Postexposure use of zidovudine	0.19	(0.06-0.52)

# Post Exposure Prophylaxis Issues

# Animal Studies of PEP Efficacy

- Data have been difficult to interpret and extrapolate to humans, but provide encouraging evidence of the effectiveness of PEP
- Reduced PEP effectiveness if:
  - Large dose of inocula
  - Delay in time to PEP
  - Shortened duration of PEP
  - Decreased dose of PEP

# Human Studies of HIV PEP Efficacy

- Little information on efficacy of PEP in humans
- Seroconversion infrequent following occupational exposure to HIV-infected blood
- Study of converters vs nonconverters showed use of zidovudine (ZDV) was associated with an 81% decrease in the risk for HIV infection
  - limitations include a small number of cases, and that cases and controls came from different cohorts (*Cardo et al, NEJM 1997;337:1485-90.*)

# Human Studies of HIV PEP: Prevention of Perinatal Transmission

- ZDV administered during pregnancy, labor, and delivery reduced transmission by 67%  
(Connor EM, et al. N Engl J Med 1994;331:1173-80.)
- Protective effect only partially explained by reduction in maternal viral load
- Protective effect observed when ZDV given only to newborn within the first 48-72 hours of life  
(Wade NA, et al. N Engl J Med 1998;339:1409-14.) ( Musoke P, et al. AIDS 1999;13:479-86.) (Guay LA, et al. Lancet 1999;354:795-802.)

# Elements of Postexposure Management: HIV

- Baseline evaluation and testing of exposed person
- Consideration of treatment
  - when to give
  - what to give
  - pregnancy in exposed
- Follow-up testing and counseling

# Postexposure Management: Baseline HIV Testing of Exposed Person

- EIA standard test
- Direct virus assays not recommended
  - p24 antigen
  - PCR for HIV RNA

# Initiation of HIV PEP

- Regard as an urgent medical concern
  - If indicated, start PEP as soon as possible after exposure (hours rather than days)
- Interval after which PEP is no longer likely to be effective in humans is unknown
  - initiating PEP even days or weeks after an exposure should be considered

# Re-evaluation of HIV-Exposed Person

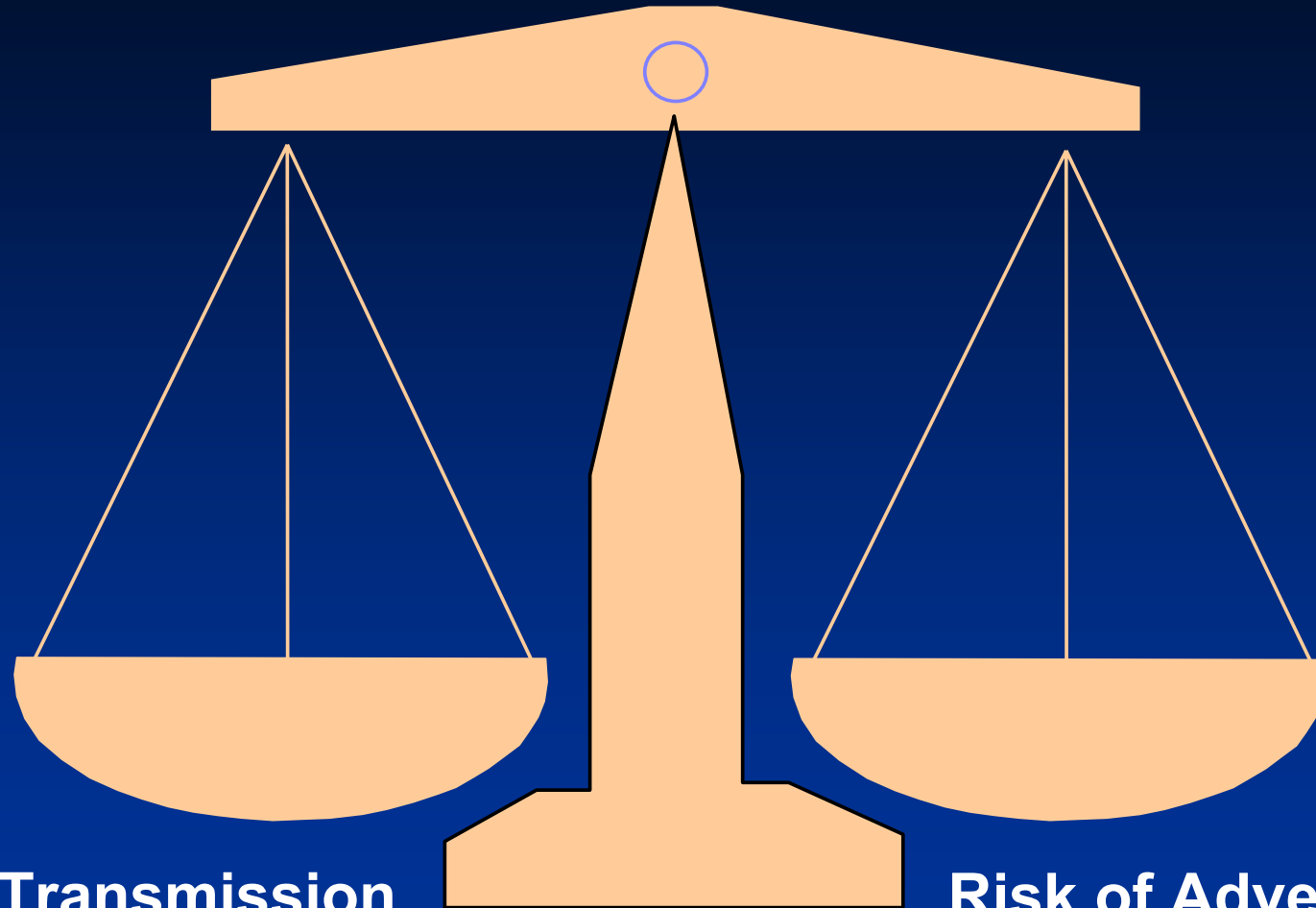
Consider re-evaluation of the exposed person within 72 hours

- additional information about the source person may become available
- if the source person has a negative HIV antibody test, stop PEP

# Important Concepts about HIV PEP

- Determining which and how many agents to use for PEP
  - Professional judgement should be used based on local knowledge and experience in treating HIV
  - Regimens should be tolerable to the exposed person

# Considerations When Using PEP



**Risk of Transmission**

**Risk of Adverse Effects**

**PEP**

# Situations Where PEP is Rarely, if Ever, Warranted

- Intact skin contact with blood and potentially infectious body fluids
- Exposure to unknown source in populations where HIV prevalence is low
- Low-risk exposure to unknown source

# Situations for Which Expert Consultation for HIV PEP is Advised

- Resistance of the source virus to antiretroviral agents
- Known or suspected pregnancy in the exposed person
- Toxicity of the initial PEP regimen

# HIV PEP Considerations in Pregnant Exposed Women

- **General principles**
  - pregnancy is not a contraindication for PEP
  - exposed person should make informed decision about PEP
- **Choosing regimen is more complex**
  - may exacerbate physiologic changes in pregnancy
  - short/long-term effects on fetus/newborn unknown
  - most data are on zidovudine
  - some drugs contraindicated during pregnancy

# Postexposure Management: Follow-up HIV Testing of Exposed Person

- If source HIV positive, test at 6 weeks, 3 months, 6 months
  - EIA standard test
  - direct virus assays not recommended
- Extending follow-up to 12 months
  - recommended for HCP who become infected with HCV following exposure to co-infected source
  - optional in other situations

# Postexposure Management: HIV Postexposure Counseling

- Side effects of PEP drugs
- Signs and symptoms of acute HIV infection
  - fever
  - rash
  - flu-like illness
- Prevention of secondary transmission
  - sexual abstinence or condom use
  - no blood/tissue donation
- Transmission and PEP drug risks if breastfeeding

*No work restriction indicated*

# Recommendations for Healthcare Facilities

- Establish a bloodborne pathogen management policy
- Implement management policies (e.g., training, hepatitis B vaccination, exposure reporting, PEP access, etc.)
- Establish laboratory capacity for bloodborne virus testing
- Select and use appropriate PEP regimens

## Recommendations for Healthcare Facilities (cont.)

- Provide access to counseling for exposed personnel
- Monitor adverse events and seroconversion
- Monitor exposure management programs (e.g., time between exposure and evaluation, testing of source persons, completion of follow-up)

# Conclusion

- Occupational exposure management is complex
- Prevention is best
  - hepatitis B immunization
  - avoiding occupational blood exposures

# Sources of Additional Information

- Division of Healthcare Quality Promotion  
Phone: 800-893-0485  
Homepage: <http://www.cdc.gov/ncidod/hip/>
- Hepatitis Hotline  
Phone: 888-443-7232  
Homepage: <http://www.cdc.gov/hepatitis>
- Needlestick!  
Homepage: <http://www.needlestick.mednet.ucla.edu>

# Sources of Additional Information

- National Institute for Occupational Safety and Health bloodborne pathogens website

<http://www.cdc.gov/niosh/bbpppg.html>

- Occupational Safety and Health Administration bloodborne pathogens website

<http://www.osha-slc.gov/SLTC/bloodbornepathogens/index.html>

