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HIV – Occupational Transmission and Exposure

Marsh Gelbart 2010

Rationale for Post Exposure Prophylaxis (PEP)

- It was estimated that the risk for HIV transmission after percutaneous exposures involving larger volumes of blood, particularly if the source patient's viral load was likely to be high, exceeds the average risk of 3 per 1,000.
- In established HIV infection, the use of combinations of antiretroviral drugs are more potent than zidovudine alone in suppressing viral replication. This, together with the increased prevalence of zidovudine resistance amongst HIV infected people, has led to the introduction of combination antiretroviral drug prophylaxis following exposure to HIV.
- Results from animal studies suggest that HIV PEP is most likely to be efficacious if started within the hour

Dynamics of infection

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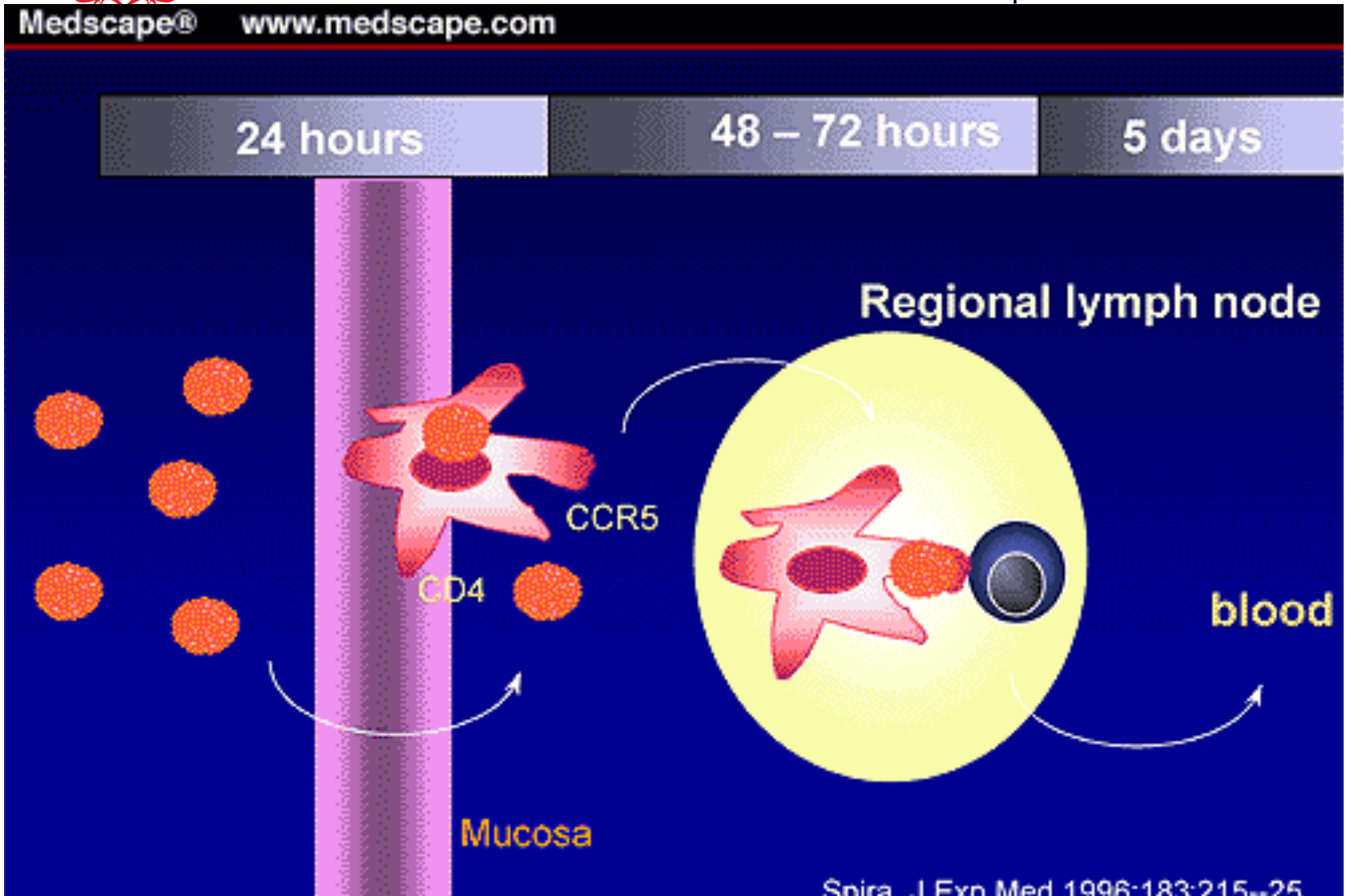
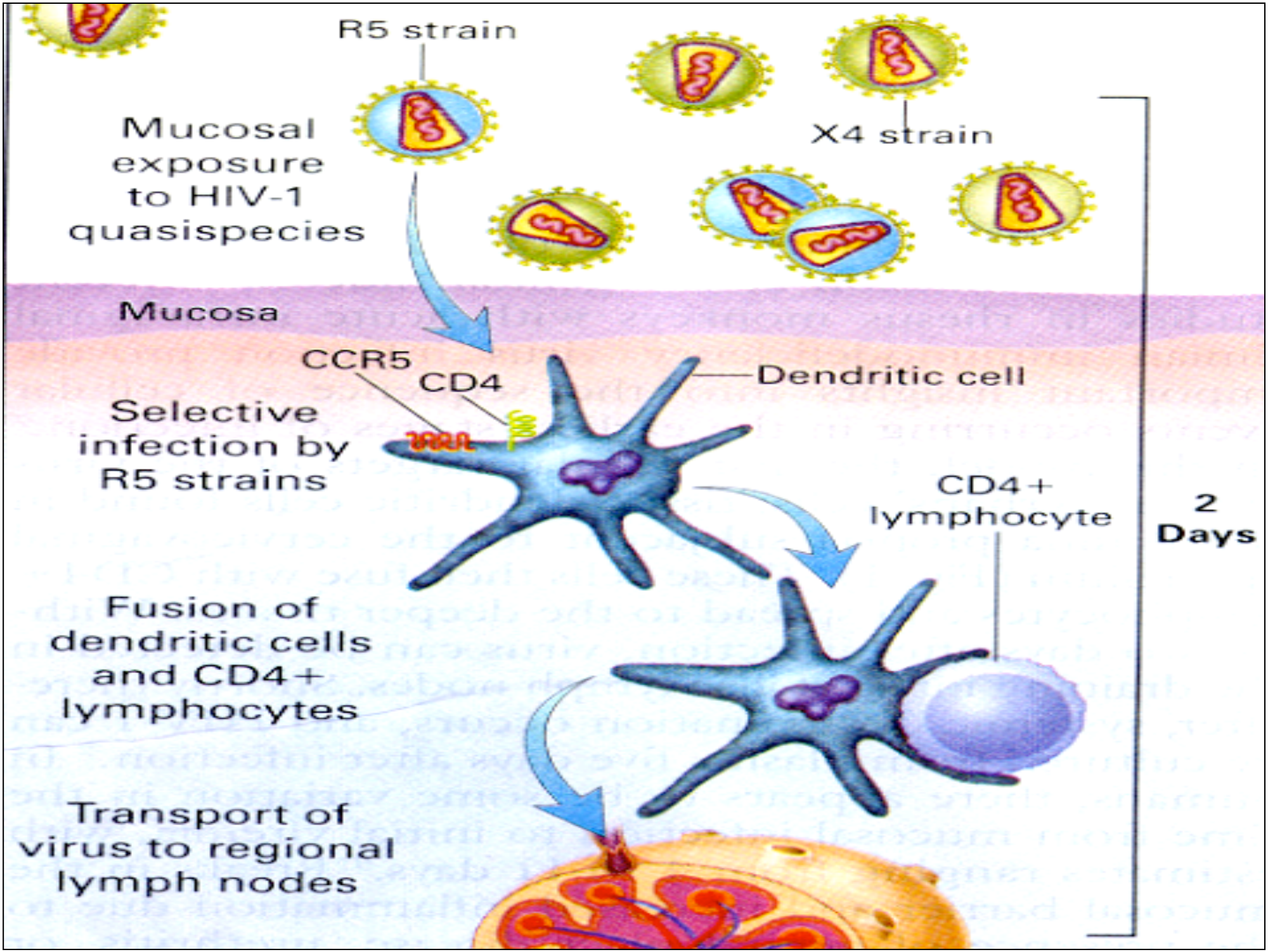
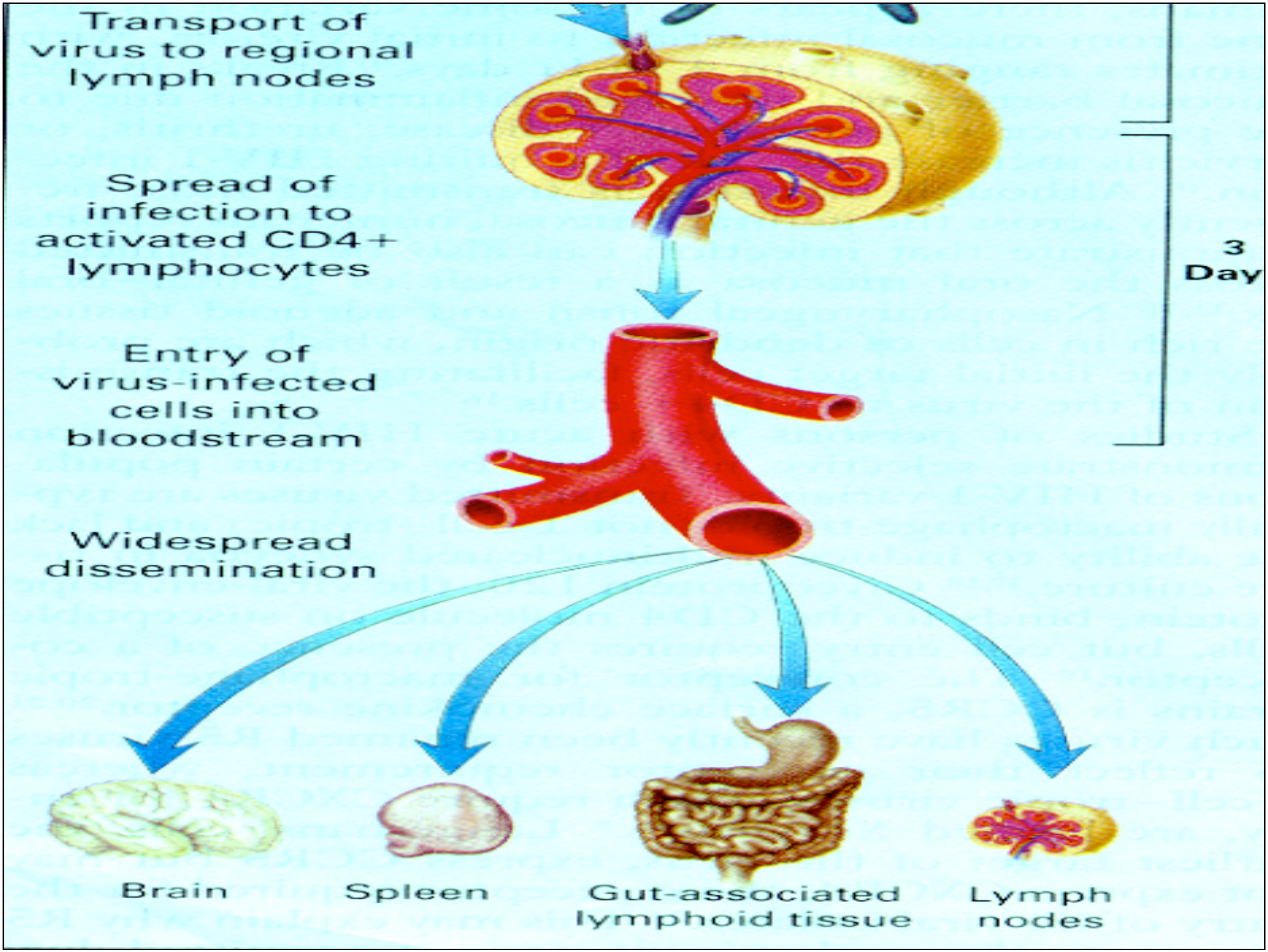



R5 strain
X4 strain
Mucosal exposure to HIV-1 quasispecies
Mucosa
CCR5
CD4
Dendritic cell
Selective infection by R5 strains
CD4+ lymphocyte
2 Days
Fusion of dendritic cells and CD4+ lymphocytes
Transport of virus to regional lymph nodes


Transport of virus to regional lymph nodes
Spread of infection to activated CD4+ lymphocytes
Entry of virus-infected cells into bloodstream
Widespread dissemination
3 Day
Brain
Spleen
Gut-associated lymphoid tissue
Lymph nodes

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Risks by exposure

Type of exposure	Estimated risk of HIV transmission per exposure
Receptive anal intercourse	**0.1-3.0%**
Insertive anal intercourse	**0.06%**
Receptive vaginal intercourse	**0.1-0.2%**
Insertive vaginal intercourse	**0.03-0.09%**
Needle–stick injury	**0.3%**
Sharing injecting equipment	**0.67%**
Mucous membrane exposure	**<0.1%**

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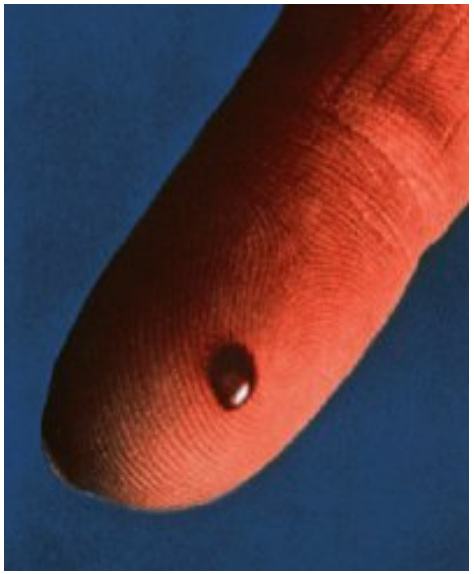
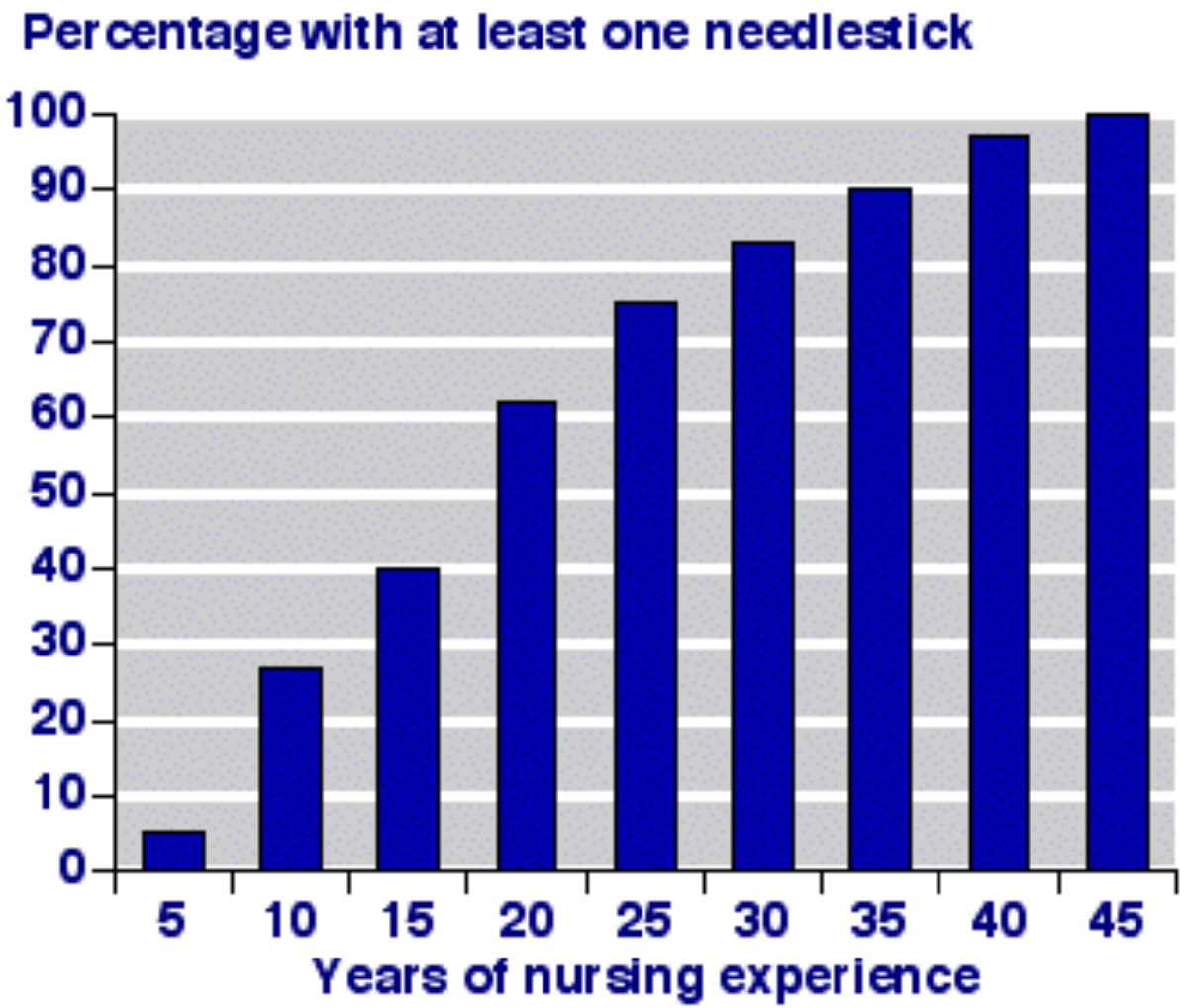
Risk reduction

- Do not resheath needles, do not disassemble after use
- Use needleless IV access systems
- Reduce use of lancets and scalpels
- Report all sharps injuries
- Personal protective equipment
- Universal procedures and precautions
- Inform and educate workers




Percentage with at least one needlestick
100
90
80
70
60
50
40
30
20
10
0
5
10
15
20
25
30
35
40
45
Years of nursing experience

Immediate action post exposure

- **Decontaminate the exposed skin or wound by washing with soap and water.**
- Application of antiseptics is of no proven benefit
- If mucous membrane exposed, site should be rinse with clean water.
- Eyes should be flushed with sterile saline eye washes

Transmission risks

- **HIV is the least transmissible of blood borne viruses**
- Following inoculation incident
  - HIV: **1 : 300** (approx' 0.1-0.5%) will sero-convert
  - HBV: **1: 3** (approx' 30%) of patients exposed will convert
  - HCV: **1: 30** (approx' 3%) become infected

Sero-converting? Possible symptoms……..

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TABLE 5. Expected frequency of associated signs and symptoms among persons with signs and symptoms of acute retroviral syndrome

Symptom/sign	%
Fever	96
Lymphadenopathy	74
Pharyngitis	70
Rash Erythematous maculopapular with lesions on face, trunk and sometimes extremities, including palms and soles; mucocutaneous ulceration involving mouth, esophagus or genitals	70
Myalgia or arthralgia	54
Diarrhea	32
Headache	32
Nausea and vomiting	27
Hepatosplenomegaly	14
Weight loss	13
Thrush	12
Neurologic symptoms Meningoencephalitis or aseptic meningitis; peripheral neuropathy or radiculopathy; facial palsy; Guillain-Barré syndrome; brachial neuritis; or cognitive impairment or psychosis	12

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Risk factors for seroconversion

- Venepuncture or IM injection
- hollow bore needles
- injury is deeply penetrating
- blood is injected during injury
- exposure of broken skin
- volume of inoculum
- stage of infection and viral load of source

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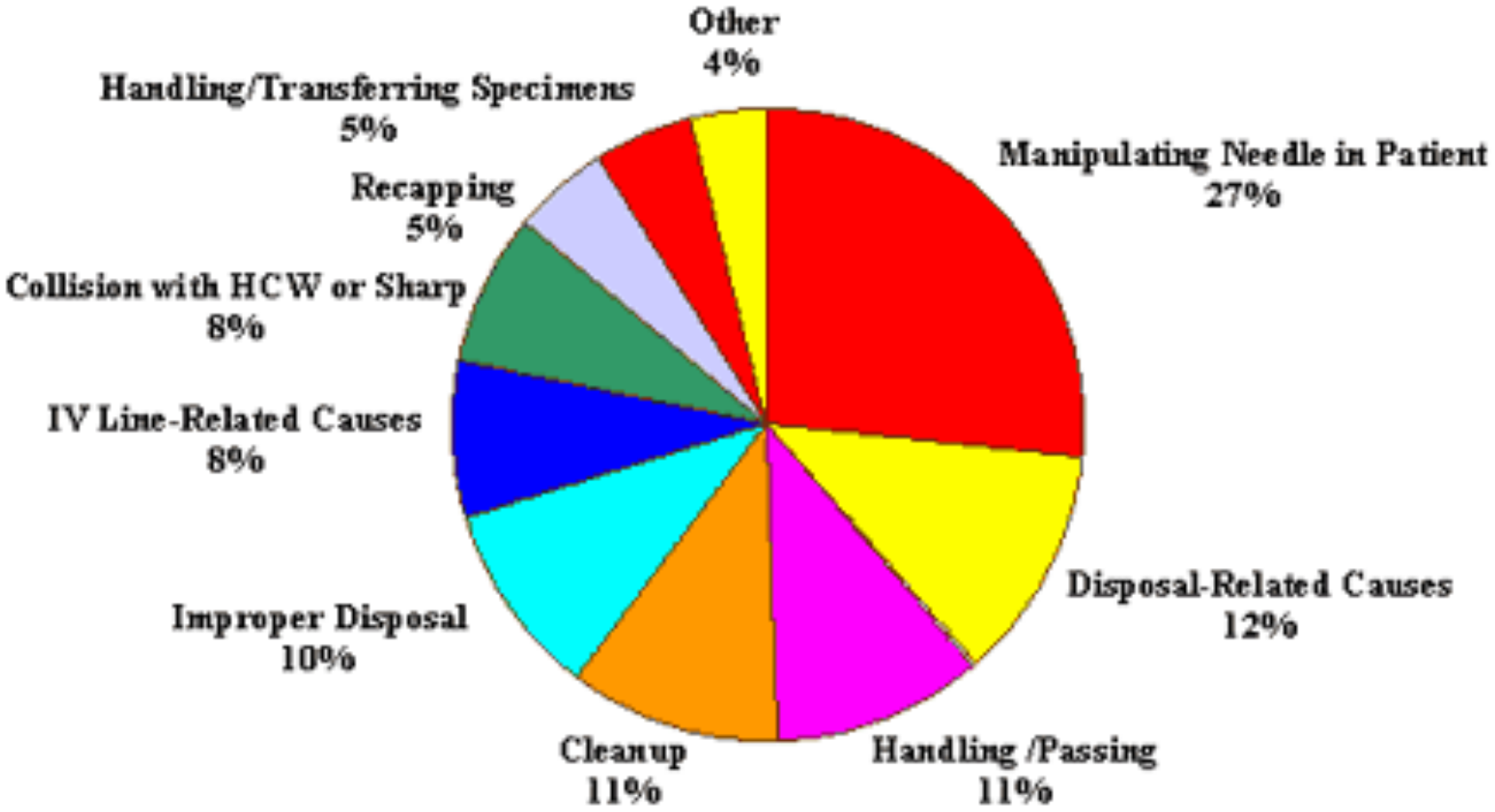
Occupational exposure

- **From July 1997-June 2000**
- In UK 293 health care workers exposed to HIV occupationally
- 138 out of 293 (47%) had post exposure prophylaxis (PEP) – a short but intense course of anti-viral medication
- Only 43 out of 138 (31%) completed 4 weeks of PEP
- 77 of 138 (56%) experienced side-effects
- 1 out of 293, developed HIV after the incident


Other
4%
Handling/Transferring Specimens
5%
Recapping
5%
Collision with HCW or Sharp
8%
IV Line-Related Causes
8%
Improper Disposal
10%
Cleanup
11%
Handling /Passing
11%
Disposal-Related Causes
12%
Manipulating Needle in Patient
27%

(NIOSH, 1999)

Post exposure management

- Assess Risk of incident
- Assess Source Patient
  - If known to be HIV positive, then the patients viral load and treatment history affects PEP
  - If HIV status unknown, inform patient of incident and gain consent for testing with pre and post test discussion

- Document fully. Reassure and explain

HIV exposure risk assessment

- A risk assessment needs to be undertaken urgently by someone other than the exposed person
- It may not be possible to ascertain all the information required, especially if sexual exposure with anonymous partners
- An immediate initial assessment should be made with what information is available – ideally PEP should be started **within one hour of exposure**
- If there is a delay in presentation of the exposed person, it is usual practice to offer PEP up to 72hrs post-exposure
- In some circumstances, PEP can be offered up to 2 weeks post exposure – consultant based decision

Post incident risk assessment

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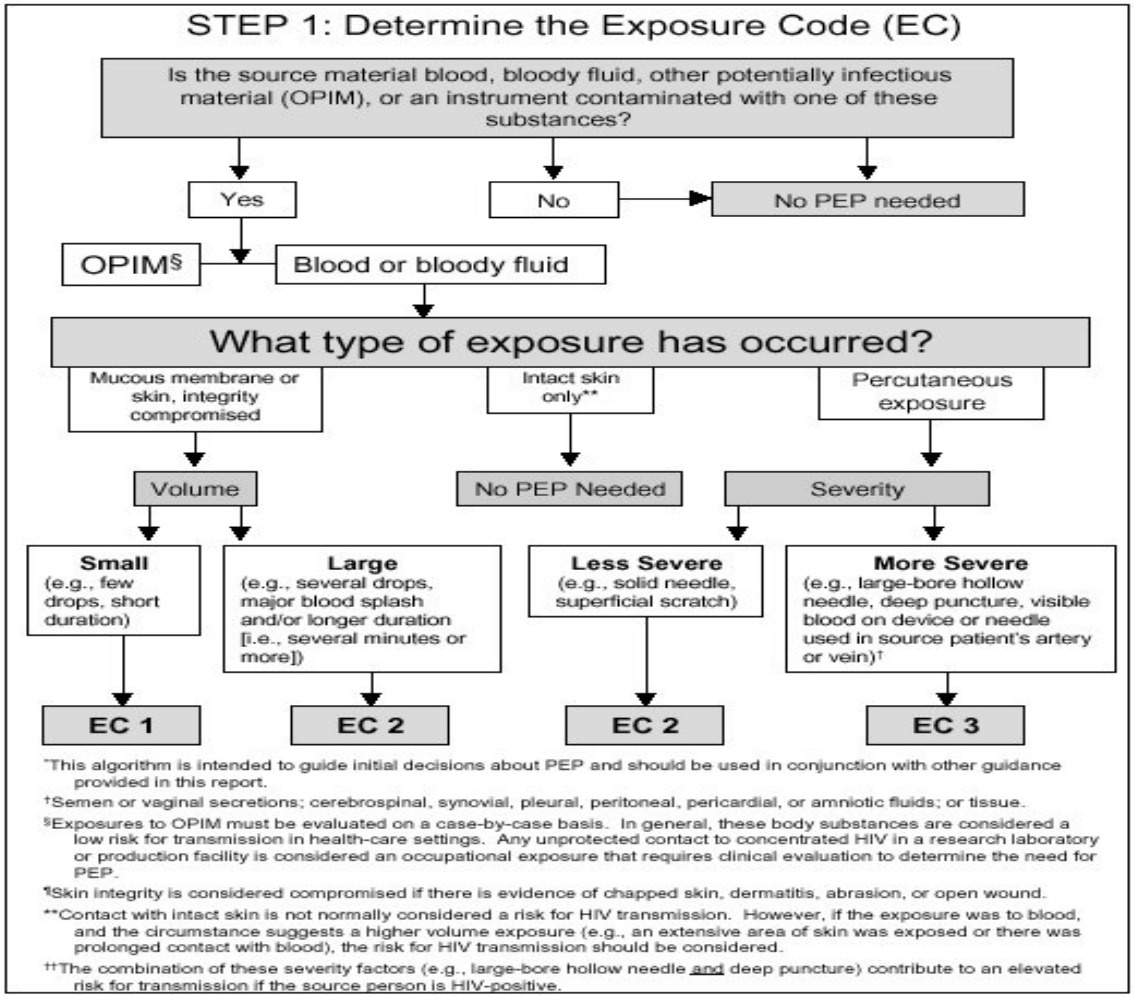
FIGURE 1. Determining the need for HIV postexposure prophylaxis (PEP) after an occupational exposure*



*This algorithm is intended to guide initial decisions about PEP and should be used in conjunction with other guidance provided in this report.

†Semen or vaginal secretions; cerebrospinal, synovial, pleural, peritoneal, pericardial, or amniotic fluids; or tissue.

§Exposures to OPIM must be evaluated on a case-by-case basis. In general, these body substances are considered a low risk for transmission in health-care settings. Any unprotected contact to concentrated HIV in a research laboratory or production facility is considered an occupational exposure that requires clinical evaluation to determine the need for PEP.

¶Skin integrity is considered compromised if there is evidence of chapped skin, dermatitis, abrasion, or open wound.

**Contact with intact skin is not normally considered a risk for HIV transmission. However, if the exposure was to blood, and the circumstance suggests a higher volume exposure (e.g., an extensive area of skin was exposed or there was prolonged contact with blood), the risk for HIV transmission should be considered.

††The combination of these severity factors (e.g., large-bore hollow needle and deep puncture) contribute to an elevated risk for transmission if the source person is HIV-positive.

What is the source patient's HIV status?

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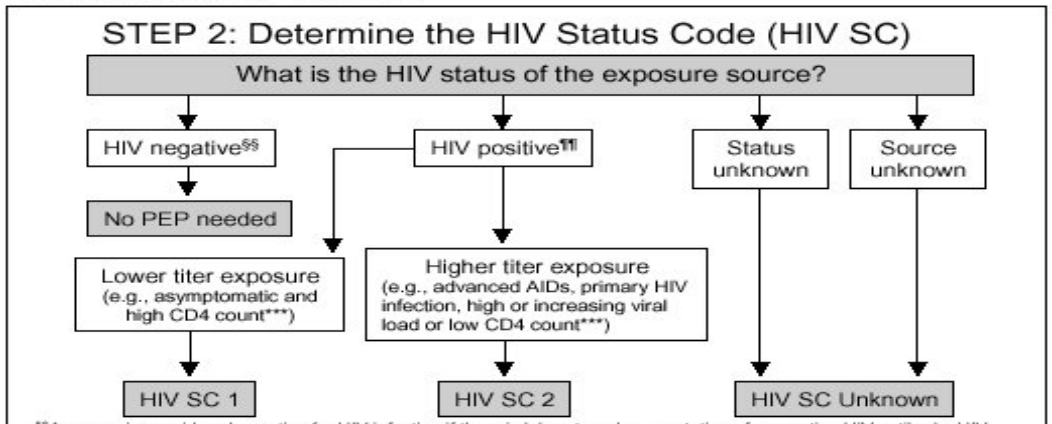
FIGURE 1. Determining the need for HIV postexposure prophylaxis (PEP) after an occupational exposure* --Continued



§§A source is considered negative for HIV infection if there is laboratory documentation of a negative HIV antibody, HIV polymerase chain reaction (PCR), or HIV p24 antigen test result from a specimen collected at or near the time of exposure and there is no clinical evidence of recent retroviral-like illness.

¶¶A source is considered infected with HIV (HIV) positive if there has been a positive laboratory result for HIV antibody, HIV PCR, or HIV p24 antigen or physician-diagnosed AIDS.

***Examples are used as surrogates to estimate the HIV titer in an exposure source for purposes of considering PEP regimens and do not reflect all clinical situations that may be observed. Although a high HIV titer (HIV SC 2) in an exposure source has been associated with an increased risk for transmission, the possibility of transmission from a source with a low HIV titer also must be considered.

STEP 3: Determine the PEP Recommendation

EC	HIV SC	PEP recommendation
1	1	**PEP may not be warranted.** Exposure type does not pose a known risk for HIV transmission. Whether the risk for drug toxicity outweighs the benefit of PEP should be decided by the exposed HCW and treating clinician.
1	2	**Consider basic regimen.**†††Exposure type poses a negligible risk for HIV transmission. A high HIV titer in the source may justify consideration of PEP. Whether the risk for drug toxicity outweighs the benefit of PEP should be decided by the exposed HCW and treating clinician.
2	1	**Recommended basic regimen.** Most HIV exposures are in this category; no increased risk for HIV transmission has been observed but use of PEP is appropriate.
2	2	**Recommend expanded regimen.**§§§Exposure type represents an increased HIV transmission risk.
3	1 or 2	**Recommended expanded regimen.** Exposure type represents an increased HIV transmission risk.
Unknown		If the source or, in the case of an unknown source, the setting where the exposure occurred suggests a possible risk for HIV exposure and the EC is 2 or 3, consider PEP basic regimen.

†††Basic regimen is four weeks of zidovudine, 600 mg per day in two or three divided doses, and lamivudine, 150 mg twice daily.

§§§Expanded regimen is the basic regimen plus either indinavir, 800 mg every 8 hours, or nelfinavir, 750 mg three times a day.

PEP?

- If the source patient involved in the needle stick incident *is* known to be HIV positive – initiate PEP protocols
- Consider PEP even if the source patient's HIV status is unknown

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Counselling the health care worker

- The health care worker needs to see a senior Dr specialising in HIV and then a health adviser
- The risks and benefits of PEP need to be fully understood
- Baseline HIV, HEP B and Hep C blood samples should be stored
- **Time is of the essence!**

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Testing – an informed choice?

The health care worker needs to explore

- **What a positive result would mean**
- **How might they cope**
- **Who could they tell for support**
- **Who have they told they are having the test**
- **Discuss benefits of knowing if positive:**
  - **Making life decisions**
  - **Treatment issues**
  - **Infection control**
  - **Reduction in anxiety / worry levels**

Regimens For Post Exposure Prophylaxis

Type	Drugs	Regimen
Basic (28 days)	Zidovudine **(Zidovir)**	600 mg/day (300 mg bid, 200 mg tid or 100 mg 4 hourly)
	Plus	
	Lamivudine **(Lamivir)**	150 mg bid
Expanded (28 days)	As above plus	
	Indinavir **(Crixivan)** or	800 mg 8 hourly
	Nelfinavir **(Viracept)**	750 mg tid

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If PEP is the chosen option?

- Commence post exposure prophylaxis
  - starter pack for **3** days with further PEP to be prescribed by HIV specialist
    - Combivir (AZT 300mg & Lamivudine 150g) 1 bd
    - Nelfinavir 1250mg bd

  Note: - if previously vaccinated, then Hep B booster should be given, if not, then Hep B Immunoglobulin

Side Effects

- AZT (Zidovudine)
  - **Common**: nausea, headaches, muscle pain, tiredness and abdominal pain
  - **Uncommon:** anaemia, muscle weakness, liver abnormalities and insomnia
- 3TC (Lamivudine)
  - **Common**: nausea, headache, pruritis
  - **Uncommon**: pancreatitis, anaemia, neutropoenia, peripheral neuropathy
- Nelfinavir (Viracept)
  - **Common:** diarrhoea
  - **Uncommon:** diabetes, abdominal pain or distension, oedema, rash

Initial follow up

Day 0-7 At this first follow up visit the HIV Team will:

- review available information and decide whether PEP should continue
- discuss any deviations from standard PEP with an HIV consultant
- assess adherence and toxicity and make relevant interventions
- promote HIV-Ab testing in exposed person at first follow up
- encourage safer sex and use of condom/ femidom during follow up
- arrange confidential psychological support and counselling as necessary
- prescribe further PEP medicines if PEP is to continue
- reinforce symptoms of seroconversion

Follow up

Day 7-28

- The patient will be reviewed at the PEP clinic on (approximately) days 7, 14, 21 and 28 post exposure in order to:
- assess adherence and toxicity
- arrange confidential psychological support and counselling as necessary
- perform the following blood tests: FBC, U&Es, LFTs, amylase, glucose and lipids
- document and give HIV-Ab test result

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Long term follow up

1 – 6 months after PEP

- The patient will be reviewed at the PEP clinic at 1, 3 and 6 months *after stopping PEP* for the following tests:
- HIV-Ab test at 1, 3 and 6 months
- HIV DNA PCR at 1 and 3 months for occupational exposures only
- HCV-Ab at 6 months for occupational exposures only

At least 6 months should elapse after cessation of PEP before a negative antibody test is used to reassure the individual that infection has not occurred.

ZDV PEP Treatment Failures in HCWs

World-wide Cases

- 18 failures in health care providers
- 5 failures in other settings
- no delay in time to seroconversion
- no adverse effects on natural history

Potential Explanations

- delay in treatment
- dose too low / low drug levels
- resistant virus
- high inoculum exposure
- treatment duration too short
- zidovudine is not efficacious

PEPSI

- Anti-retrovirals can be given not just after occupational exposure, but after sexual exposure too.
- In such cases it is known as post exposure prophylaxis/ sexual intercourse or PEPSI
- Some articles refer to post exposure prophylaxis/sexual exposure or PEPSE – it's the same

When to give PEPSI

Exposure	Source HIV+	Source Prevalence high (>10%)	Source Prevalence low
Receptive anal sex	Yes	Yes	Consider
Insertive anal sex	Yes	Consider	No
Receptive vaginal sex	Yes	Consider	No
Insertive vaginal sex	Yes	Consider	No
Fellatio with ejaculation	Consider	Consider	No
Fellatio without ejaculation	No	No	No
Splash semen into eye	Consider	No	No
Cunnilingus	No	No	No

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