

# **Division of Blood Transfusion Services**

**Ministry of Health and Family Welfare**



# BIOSAFETY



# Teaching Aims

- Identify Biosafety Issues in the BTS work areas
- List the key requirements for the safe disposal of biological and chemical waste



# Definition

The use of lab practices and procedures and equipments for safety when working with potentially infectious microorganisms.



# Why Biosafety Practices?

Protection of

- Workers
- Products
- Co workers
- Lab support personnel
- Environment
- Regulatory requirements



# Risk of occupational transmission of infection depends on

- Prevalence of infected individuals in the population
- The frequency of exposure to contaminated medical instruments
- The relative infectivity and concentration of the virus
- If there is an exposure to a large quantity of blood
- Deep needle stick injury
- Injury with hollow bore needles
- Patient samples positive for TTIs



# Infectious risk to HCWs From Percutaneous Exposure

## Rule of 3'

|     |   |              |
|-----|---|--------------|
| HIV | - | 0.05 to 0.3% |
| HCV | - | 3.0 to 10%   |
| HBV | - | 10 to 30%    |

**Others at Risk: Municipal workers, Rag pickers & Community**



# Viral Load in Circulation

- HIV – 10 to 100 viral particles/ml of plasma
- HCV- 10,000 to 100,000 viral particles/ml of plasma
- HBV- 10,000,000 viral particles/ml of plasma





# Modes of Exposure to Blood Pathogens in the Laboratory

| Lab Procedure                      | HCW at Risk                                 | Source of Transmission   |
|------------------------------------|---|--|
| Collection of blood/body fluids    | Doctors/Laboratory technician/Nursing staff | Needle stick injury, broken specimen container, blood contamination of hand with skin lesion/breach  |
| Transfer of specimen /blood unit   | Laboratory technician and transport worker  | Contaminated exterior of the container/ requisition slip   |
| Processing of specimen /blood unit | Laboratory personnel                        | <p>Puncture of skin or contamination of skin/mucous membrane from</p> <ul style="list-style-type: none"> <li>■ Contaminated work surface</li> <li>■ Spill/splash of specimen container</li> <li>■ Faulty techniques</li> </ul> |

# Modes of Exposure to Blood Pathogens in the Laboratory (contd...)

| Lab Procedure                               | HCW at Risk                           | Source of Transmission  |
|---|---------------------------------------|---|
| Cleaning /washing                           | Support staff                         | Puncture/contamination of skin from <ul style="list-style-type: none"> <li>■ Contaminated glassware</li> <li>■ Sharps</li> <li>■ Contaminated work surface</li> </ul> |
| Disposal of waste                           | Laboratory personnel<br>support staff | Contact with infectious waste<br>specially sharps   |
| Transport to distant<br>laboratory/hospital | Transport/postal staff                | Broken/leaking container  |

# Interruption of Transmission

- Barriers
- Disinfection
- Vaccination
- Post exposure prophylaxis
- Safe biohazardous waste disposal



# Vaccination

- All unvaccinated blood bank staff must be vaccinated for Hepatitis B with three doses (0,1 and 6 months).
- Revaccination should be done once in 10 years.
- Previously vaccinated health care providers need to check the Hepatitis B antibody titre and revaccinate if the titres are less than 10 IU.



# Post-exposure Prophylaxis (PEP)



# Post-exposure Prophylaxis

- Infectious exposure is defined as a percutaneous injury, contact with mucous membrane, prolonged contact with intact skin or immediate contact with breached skin.
- Exposed site must be washed immediately.
- Staff health services must be contacted immediately.
- Blood should be collected for testing after written informed consent.



# Post-exposure prophylaxis for Hepatitis B.

| Exposed Person                            | Treatment when source is found to be  |                     |  |
|---|---|---------------------|--|
| Unvaccinated                              | HBsAg – Positive  | HBsAg–negative      | Source not tested or unknown<br>Initiate HB vaccine  |
|   | HBIG x 1* and initiate HB vaccine   | Initiate HB vaccine |  |
| Previously vaccinated known responder     | Test for anti-HBs<br>1. If adequate, no treatment<br>2. If inadequate, HB dose                              | No treatment        | No treatment   |
| Previously vaccinated known non-responder | HBIG x 2 or HBIG x 1 plus 1 dose of HB vaccine  | No treatment        | If known high-risk source, may treat as if source were HBsAg-positive  |
| Response unknown                          | Test for anti-HBs<br>1. If inadequate HBIG x 1 plus HB vaccine booster dose<br>2. If adequate, no treatment | No treatment        | Test for anti-HBs<br>1. If inadequate <sup>®</sup> , HB vaccine booster dose<br>2. If adequate, no treatment |



\*HBIG dose: 0.06ml/kg IM. @adequate anti-HBsAg is >10 SRU by RIA or positive by EIA



# Hepatitis C

- There is no vaccination and no recommended chemoprophylaxis.
- Follow up testing for sero-conversion is recommended.





# Post-exposure prophylaxis for HIV



# HIV Post-exposure prophylaxis evaluation

| <b>Exposed</b>   | <b>Status of Source (see below)</b> |                                |                                | <b>HIV status<br/>Negative</b>  |
|--|-------------------------------------|--------------------------------|--------------------------------|---|
|  | <b>HIV + and<br/>low Risk</b>       | <b>HIV + and<br/>high Risk</b> | <b>HIV status<br/>unknown</b>  |   |
| <b>Mucous membrane / non-intact<br/>skin; small volume (drops)</b>   | <b>Consider<br/>2-drug PEP</b>      | <b>2-drug PEP</b>              | <b>Consider<br/>2-drug PEP</b> | <b>No PEP is<br/>required<br/>if the source<br/>blood is<br/>confirmed<br/>HIV<br/>negative</b> |
| <b>Mucous membrane / non-intact<br/>skin; large volume (major<br/>blood splash)</b>  | <b>2-drug PEP</b>                   | <b>3-drug PEP</b>              | <b>Consider<br/>2-drug PEP</b> |   |
| <b>Percutaneous exposure: not<br/>severe solid needle, superficial</b>   | <b>2-drug PEP</b>                   | <b>3-drug PEP</b>              | <b>Consider<br/>2-drug PEP</b> |   |
| <b>Percutaneous exposure: severe<br/>large bore hollow needle, deep<br/>injury, visible blood in device,<br/>needle in patient artery/vein</b> | <b>3-drug PEP</b>                   | <b>3-drug PEP</b>              | <b>Consider<br/>2-drug PEP</b> |   |

Low risk exposure: source is asymptomatic and has normal CD4 counts

High risk exposure: source has advanced AIDS or low CD4 counts.



# Post-exposure prophylaxis for HIV

**Basic regimen:  
2 drugs (NRTIs)  
(4 weeks therapy)**

Zidovudine (AZT/ZDV) – 300mg twice/day is used for all types of exposure  
+  
Lamivudine (3TC) – 150 mg twice a day is added to increase the effectiveness of ZDV and to prevent resistance to ZDV

**Expanded Regimen:  
3 drugs (2 NRTIs + PI)  
(4 weeks therapy)**

Basic Regimen (AZT/ZDV + 3TC)  
+  
Nelfinavir 750 mg three times daily or any other boosted protease inhibitor. (for higher risk categories – consult expert)



# Good Lab Practices

- General rule - all samples be treated as potentially infectious
- Universal precautions are to be consistently used by all HCW



# General Lab Hygiene

- Cleaning of work surfaces and equipment with suitable disinfectant
- Restricted entry to work areas.
- Avoid eating, drinking in the labs.
- Avoid mouth pipetting.
- Use laminar air flow hoods where necessary.



# Universal Precautions

- Barrier protection
- Hand washing
- Safe techniques
- Safe handling of sharp items
- Safe handling of specimen (blood etc.)
- Safe handling of spills of blood/body fluid
- Use of disposable/ sterile items
- Safe techniques -mechanical pipetting device
- Immunisation with hepatitis b vaccine



# Barrier Protection

- Gloves
- Plastic aprons/ Lab gowns
- Masks
- Occlusive bandages



# Barrier Protection (contd...)

## Gloves

- Wear well fitting disposable vinyl gloves
- Change gloves if torn or visibly contaminated with blood
- Remove gloves before handling door knobs, telephones, pens, leaving the lab

## Laboratory gowns

- Should be worn when in the lab. and should be removed before leaving.
- Use plastic aprons while cleaning re-usables and disposing waste.





# Barrier Protection (contd...)

## Facial protection

- Cheap deflector masks or protective glasses should be used if splashing of sample is expected.

## Occlusive bandage

- Cover all cuts and breaks with wash proof bandage before patient care.



# HAND WASHING

- Wash thoroughly with water and soap immediately - after contamination with blood/body fluids.
- After removing gown/gloves.
- Before eating, drinking & leaving the lab.
- Labs should be provided with liquid soap dispensers.
- Use moisturising hand cream after every hand wash.

Gloves are not a substitute for hand washing



# Safe Handling Techniques in Lab

- Centrifuge tubes with safety caps should be used

## Sharps:

- Do not bend/ break/ recap/ manipulate or remove needles from disposable syringe.
- Extreme care should be taken to avoid auto-innoculation.
- Chipped/broken glassware should be disposed off in appropriate containers.
- Don't use hands to pick up broken glass.

# Safe Handling of Specimen

- Collect samples in sterile screw cap plastic containers.
- Seal properly to prevent spill/leakage.
- Use sterile disposable syringes and needles/vacutainers. Cover cuts with waterproof bandages.
- Transfer leaked samples to fresh container, rewrite patient information on the new container.
- Reject requisition slip contaminated with blood or handle using gloves in case of emergency.



# Safe Handling of Spills

## In case of blood spills

- Cover the area with paper towels or gauze sponges to absorb the liquid.
- Cover the spill area with disinfectant solution. (1 % sodium hypochlorite –freshly prepared).
  - Leave it for 30 min
  - With 4% hypochlorite solution leave for 10 minutes.
- Wash the area thoroughly with soap and water.
- Contaminated material to be disposed off as infectious waste.

# Prompt Accident Management

- Spillage
- Rupture of blood bag in the centrifuge, breakage of tubes.
- Leakage of blood bag in transport containers.
- Needle stick injury; blood splashes





**To Health Care Workers and Community**



# Learning Outcomes

You learned about biosafety Issues in the BTS work areas and the safe disposal of biological and chemical waste

