10.0 OBJECTIVES

At the end of this unit you should be able to:

- List the sources of infection;
- Understand the principles of infection prevention;
- Perform the procedure for entering into the nursery;
- Identify the various types of disinfectants/germicides used in nursery;
- Follow the instructions for using disinfectants; and
- Disinfect patient care area and patient care equipment.

10.1 INTRODUCTION

An infection is an invasion of the body by pathogens or micro-organisms capable of producing diseases. Newborn in hospitals and health care settings can easily acquire infection because they are in high risk group. Such infections are transmitted by health care practices/approaches.

Hence, it is important to prevent the transmission of infection by following various disinfection procedures.

Disinfectant is an agent usually chemical that kills any types of pathogenic micro-organisms but not necessarily the more resistant forms such as spores. In this unit we will discuss regarding disinfection and housekeeping for infection control.
10.2 SOURCES OF INFECTION

The sources of infection in newborn unit could be:

- Personnel working in the unit
- Infected newborns
- Fomites – equipments
- Environment
- Invasive procedures

10.3 PRINCIPLES OF PREVENTION OF INFECTION

By practicing the following principles of infection prevention we can protect the baby, mother and care provider from infection:

- Provide routine care to the newborn baby
- Consider every person (including the baby and staff) as potentially infectious
- Wash hands or use an alcohol based hand rub
- Wear protective clothing and gloves
- Use antiseptic techniques
- Handle sharp instruments carefully and clean, sterilize or disinfect instruments and equipment as required.
- Routinely clean the newborn special care unit and dispose off waste
- Isolate babies with infection to prevent spread of nosocomial infection.

10.4 PROCEDURE FOR ENTERING INTO THE NURSERY

- Keep strict restriction for entry into the nursery. Allow only heath care providers and parents. Do not allow visitors to enter into the nursery.
- Remove shoes, socks and woollens (wear nursery slippers) before entering the newborn unit.
- Please note that change of shoes though does not help in controlling infection but it does prevent the unwanted entry of infectious agents.
- Remove watch and rings upon entering nursery and wash hands and arms thoroughly by following the tips mentioned below:
  - Use plain or antimicrobial soap for hand washing (bar, liquid or powder).
  - Wash hands and arms up to the elbow for at least 2 minutes according to six steps of hand washing as per the following sequence (Fig 10.1).
    a) Palms and fingers and web spaces
    b) Back of hand
    c) Fingers and knuckles
d) Thumbs  
e) Fingertips  
f) Wrists and forearm up to the elbow

- Wash hands for at least 30 seconds before touching the next baby after you have handled an infected neonate.
- If the baby is uninfected, use alcohol based hand rub (sterillum or 70% alcohol) for hand washing before touching another newborn.
- Note that rinsing hands with alcohol or sterillium is not a substitute for proper hand washing.
- Make use of single use autoclaved sterile towel or disposable paper towel for drying the hand.
- Trim the nails and avoid nail polish
- Use mask and sterile gown for all invasive procedures e.g. lumbar puncture
- Wear sterile gown after hand washing and prior to entry into the main unit.
- Always use sterile gloves for all invasive procedures.
- Wash gloved hands to remove blood stains and secretions from the gloves and then discard them in a container of polar bleach. Wash hands again.

![Fig.10.1: Six Steps of hand washing](image)

10.5 TYPES OF DISINFECTANTS/ GERMICIDES USED IN NEWBORN UNIT

Various disinfectants/germicides used in newborn unit is summarized in Table 10.1.
Table 10.1 Disinfectants and Germicides used in newborn care unit

<table>
<thead>
<tr>
<th>Name</th>
<th>Indication for use</th>
<th>Directions for use and special considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacillocid spray (2%)</td>
<td>• Walls of nursery&lt;br&gt;• Incubators and warmers (when not in use)&lt;br&gt;• Surface of weighing machine</td>
<td>• Prepare solution as per instruction of manufacturer&lt;br&gt;• Put off air conditioners at the time of spray</td>
</tr>
<tr>
<td>Cidex (2%) (Glutaraldehyde)</td>
<td>• Oxygen/suction tubings&lt;br&gt;• Face mask and Ambu bag&lt;br&gt;• Reservoir</td>
<td>• Before immersing into cidex, clean thoroughly with soap and water&lt;br&gt;• Time of contact (once prepared, solution is active for 14 days)&lt;br&gt;• For sterilization: 4-6 hours&lt;br&gt;• For disinfection: 15 mins</td>
</tr>
<tr>
<td>Ecoshield H₂O₂ 11% w/v, Silver Nitrate 0.01% w/v/ Formalin (40%)</td>
<td>Fumigation of nursery</td>
<td>Routine fumigation:&lt;br&gt;• 200 ml in 800 ml of water per 1000 cubic feet area for 60 minutes for aerial fumigation&lt;br&gt;• 30 ml formalin with 90 ml water per 1000 cubic feet area. Nursery is to be sealed properly. Switch off AC and seal AC duct. Take desired amount of formalin and water in the OT care. Switch on the machine for half an hour. Open and clean the nursery after 6 hrs.</td>
</tr>
<tr>
<td>Sodium hypochlorite (bleach 1%)</td>
<td>Sharps/needles and disposables</td>
<td>Keep the solution covered, change it every 24 hours</td>
</tr>
<tr>
<td>Spirit (70% alcohol)</td>
<td>Skin preparation, cleaning laryngoscopes/blades, tape measures, stethoscope</td>
<td>Do not use to clean incubators and warmers</td>
</tr>
<tr>
<td>Soap and water</td>
<td>Oxygen hood, feeding utensils, swab containers, injection tray, face mask, buckets</td>
<td>After washing in soap and water, boil the feeding utensils for 10 min</td>
</tr>
<tr>
<td>Phenyl</td>
<td>Cleaning floors</td>
<td>As per the instruction of manufacturer. Use daily in morning shift/ as required</td>
</tr>
<tr>
<td>Betadine (5%, w/v)</td>
<td>Skin preparation</td>
<td>Use undiluted</td>
</tr>
</tbody>
</table>

**Note:** Ecoshield is an eco-friendly, non-toxic and safer chemical agent for fumigation.

**10.6 GENERAL INSTRUCTIONS FOR USING DISINFECTANTS IN NEWBORN UNIT**

- Follow manufacturer’s instructions
- Check expiry date before using
- Use recommended dilution
- Label containers – date of issue and expiry
- Empty container after use
- Wash and disinfect container before reuse
- Do not refill container without disinfecting container between each use
- Topping up is not allowed
- Do not use the same container to store other solutions
- Do not leave disinfectant container open at any time
- Wash and clean articles before disinfecting

10.7 CLEANING AND DISINFECTION OF NEWBORN CARE UNIT

10.7.1 Cleaning and Disinfection of Newborn Care Area

- Ensure that the floor and walls are cleaned once in each shift by wet mopping with dettol/2% Bacillol/Phenyl solution and mop is changed for each room.
- Ensure that the windows, walls, storage shelves are scrubbed periodically with dettol/bacillol.
- Make sure that the sinks and wash basins are scrubbed daily with vim, surf and teepol.
- Make sure that the fans are cleaned with wet clean cloth once a week.
- See that the plastic bags are put in dustbin, also these bags should be sealed before they are removed. Dustbins should be cleaned and washed properly under running water. Ensure that it is not leaking. The bin must always be kept closed.
- See that the buckets are cleaned everyday in the morning shift with soap and water.
- Transfer the babies who remain in the nursery for an extended period to a clean and disinfected unit periodically. No baby should remain in the incubator longer than 7 days without cleaning.
- The nursery should be fumigated as per requirement. For room of 1000 sq ft size, take one liter formaldehyde and add 450 gms KMN04 in it.

Table 10.2: Housekeeping routines

<table>
<thead>
<tr>
<th>Name</th>
<th>Disinfection Method</th>
<th>Frequency &amp; other considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floor</td>
<td>Wet mopping with phenyl</td>
<td>Once in each shift, No dry sweeping, Do not use 2% gluteraldehyde (cidex)</td>
</tr>
<tr>
<td>Walls</td>
<td>2% Bacillocid</td>
<td>Once in each shift</td>
</tr>
<tr>
<td>Fans</td>
<td>Wipe with wet clean cloth</td>
<td>Once in a week</td>
</tr>
<tr>
<td>Window AC</td>
<td>Surface and filters to be washed with soap and water</td>
<td>Once a week</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>Defrost and clean with soap and water</td>
<td>Once in a week</td>
</tr>
<tr>
<td>Buckets</td>
<td>Soap and water</td>
<td>Daily in morning shift</td>
</tr>
<tr>
<td>Sinks</td>
<td>Vim/surf</td>
<td>Daily in morning shift or as required</td>
</tr>
</tbody>
</table>
These are general guidelines which may be adapted based on the availability of disinfectants and the infection control policy of the hospital. Refer Table 10.2 for housekeeping routines in newborn care area.

10.7.2 Cleaning and Disinfection of Newborn Care Equipments

1) Clean the **cots** everyday with savlon/detol/bacillol.

2) Clean **open care units, radiant warmer and incubator** everyday with soap water, if occupied. If not occupied, clean with 2% bacilloicid.

3) Clean the **stethoscope, measuring tape, BP cuffs, probes of radiant warmer/incubator, pulse oximeter** with spirit swab daily.

4) **Thermometers**
   - Wipe exterior with alcohol after each use
   - Store them dry in a bottle containing dry cotton
   - Keep separate thermometer for each baby

5) **Respiratory equipments**
   a) **Laryngoscope** – disinfect with spirit swabs (thoroughly daily and after each use). Wrap in autoclaved cloth, put date on cover.
   b) **Laryngoscope blades** – ensure that these are autoclaved and changed daily if ventilator is being used. Alternatively, cidex (10 minutes) may be used.
   c) **Endotracheal tubes** – use disposable tubes. Non disposable tubes can be disinfected in 2% glutaraldehyde (cidex) for 10 minutes.
   d) **Compressor** – clean filter everyday.
   e) **Oxygen hood** – clean daily with soap and water. Do not use alcohol on plexiglass hoods. Dry with autoclaved linen
   f) **Face mask** – clean daily and after each use with soap and water, immerse in cidex for 20 minutes, revise in distilled/running water, dry with autoclaved linen and wrap in autoclaved linen and put date.
   g) **Resuscitation bag and reservoirs, oxygen tubings, bottle and tubings of suction machine:** clean with detergent/soap and water after dismantling. Immerse in cidex for 4 – 6 hours. Rinse in distilled water. Dry, wrap in autoclaved linen and put a date.
   h) Clean the **pulse oximeter, phototherapy units** with wet mop with plain water daily.
   i) **Suction apparatus**
      - Change the tube connected with suction bottle daily.
      - Flush the tube under running water, dry and autoclave daily.
      - Change the suction bottles daily. Clean suction bottle with water and detergent and then autoclave daily.
      - See that the suction bottle contains hypochlorite solution.
      - Use disposable suction catheter.
6) **Feeding utensils**
- Wash the feeding cups with soap and water immediately after use. Then these should be boiled for 10 minutes.
- Use disposable feeding tubes. In-dwelling naso-gastric tube should be changed once in 24 hours.

7) **Mackintoshes**
- Decontaminate by immersing in a tub of 0.5% chlorine/sodium hypochlorite/chlorhexidine solutions.
- Spread the mackintosh on a flat surface and wet it by pouring water on it.
- Use a piece of clean cloth or a plastic scrubber to apply soap and wash away the soap using water.
- Repeat the above process on the other surface.
- Dry it in shade on a dry horizontal surface.
- When dry, powder it lightly with dusting powder and roll it with a paper lining on it.

8) **Rubber tubes and catheters**
- Hold the tube upside down under running water to let the stream of water run through it.
- Use swab stick to remove any organic matter blocking the tip of the tube, and eye of the catheter, if needed. Ensure patency of each by seeing free flow of water through the eye of the catheter and tip of the tube.
- Using soap and water clean the dirt and grease on the surface of the catheter or tube.
- Hang the tubes and catheters to dry in a cool/shaded place.
- After drying, separate same sized catheters and tubes.
- Powder the outer surface using dusting powder; coil the tube by securing the tip into the broader end.
- Wrap individual tube and catheter using a piece of thin cloth and boil for five minutes or autoclave.

9) **Gloves**
- Gloves are considered to be contaminated with body secretions which may be highly infective. Therefore, it is essential that the wearer decontaminates the gloves on hands before removal by dipping them either in the disinfectant solution, 0.5% chlorine solution or just washes hands under the running water even if they are disposable gloves.
- Remove gloves and discard in a decontamination bucket.
- Disposable gloves should be sent for autoclaving and shredding.
- For re-usable gloves (red rubber gloves used for housekeeping): wash the gloves using soap and water first from the outside surface and then the inside surface by reversing them.
10) **Rubber Articles**

- **Autoclaving:** this is the best method of sterilization of rubber good. It is done at a lower temperature of 250 – 254°F or 121-123°C and pressure of 15-17 pounds per square inch, for 15 minutes.

- **Boiling:** wrap the rubber item to be boiled in soft, thick cloth and boil for 15-20 minutes. Hard rubber goods should not be boiled for more than five minutes and cooled fast to retain their shape.

- **Chemicals:** chemical sterilization can also be done using the following chemicals:
  
  Savlon 100% 30 minutes  
  Glutaraldehyde 2% 10-20 minutes for chemical disinfection and 10 Hours for chemical sterilization  
  Alcohol 50-70% 20-30 minutes

11) **Glass Items**

- **Disinfect** the item by immersing in 0.5% chlorine/sodium hypochlorite/chlorhexidine solution minimum for five minutes in a plastic container covered with lid. This will lessen the number of micro-organisms on the surface of the item.

- **Clean** glasswares using mild liquid soap because strong soaps and detergents can damage the smooth surface of glass.

- **Use** plastic brushes of an appropriate size to cleanse the tubes, brushing dislodges sticky substances and organic matter from corners and grooves.

- **Rinse** the glass items under cold running water to wash off the organic material.

- **Dry** the item on a rack or appropriate stand by placing the item in an inverted position to drain water from the items.

12) **Enamel wares**

- **Empty** the contents of used enamelware e.g. in case of bowls, basins, kidney trays to avoid contamination and bad odours.

- **Immerse** the item in a chlorine solution of 0.5%.

- **To disinfect,** wash the item with cold water and then hot soapy water and rinse, using water jet/stream. Remove residual fluid remaining in the item after cleaning.

- **Dry** the item by keeping in an inverted position. Store separately, keep in an inverted position in the appropriate cupboard/shelf to deodorize and to prevent growth of bacteria.
If needed, boil the item in a big water-filled container. Ensure that the item is fully dipped in the water and cover the container. There is no need to wrap the item. Boil for ten minutes to destroy pathogens.

As required send for autoclaving wrapped in a piece of cloth or paper, put label on the wrapper, one can also use chemicals for sterilizing the item.

13) Stainless Steel Items

- All stainless steel items are heat-resistant, anticorrosive and long lasting but expensive, hence they should be handled well.
- Do not boil stainless steel items repeatedly as they get dull.
- They can be easily sterilized using chemicals and by autoclaving.
- Always use gloves while cleaning and washing soiled/contaminated instruments.
  a) Instruments
    - Always immerse the used instruments in 0.5% of chlorine solution for five minutes to disinfect.
    - Wash the instrument in cold running water, paying special attention to the tips, toothed end, and grooves of forceps to clean the instrument effectively.
    - Separate sharp instruments from other blunt and fine-tip instruments to maintain inventory, to have easy access and to prevent damage.
    - Put a hard rubber cap on fine-tip instruments. Sort out instruments of the same size and type together to protect the tip from damage.
    - Dry them thoroughly. Wrap and make different packs e.g. bowl, forceps etc. and prepare for autoclaving to prevent growth of microorganisms.
  b) Needles
    - Decontaminate all types of needles attached to syringe and flush with 0.5% chlorine solution /chlorhexidine/ sodium hypochlorite immediately after use.
    - Discard the disposable injection needle with syringe either in a puncture resistant container or destroy the needle still attached to the syringe in needle destroyer to segregate the items as per the Centers for Disease Control (CDC) classification to prevent misuse.
    - Send the puncture-proof container for incineration to prevent the misuse/reuse.
    - Send the stainless steel needles for autoclaving packed with syringes in mizor to destroy all types of pathogens.
Techniques in Newborn and Infant Care

c) **Sharp Instruments**
- Immerse the sharp instruments in a 0.5% chlorine solution or in 2% glutaraldehyde for 20 to 30 minutes. Add antirust agent e.g. Sodium Nitrate, 0.1% if available, to disinfect/sterilize the instruments.
- Remove from the disinfectant solution, rinse in sterile water to remove chemicals and avoid rusting. Steam and wipe dry using a dry piece of sterile cloth.
- Store in an appropriate container for ready re-use.

14) **Cleaning other articles**
- Clean in cold water then in warm, soapy water and rinse to remove any dirt.
- Empty and rinse items like kidney trays, I/V sets, syringes (barrel and plunger separated) of their contents in drain and immerse in a 0.5% chlorine solution.
- Discard I/V sets, drainage tubes, catheters, cannulas, syringes, I/V fluid bottles into a blue bag. Send for incineration to dispose off properly and prevent recycling.

15) **Linen, Blanket and Blanket Cover**
- Ensure each delivery of clean linen contains sufficient linen for at least one 8 hour shift.
- Remember that no new garment or linen is used for neonates without prior laundering.
- Make sure that linen and cotton used in the intensive care, intermediate care and admission areas is clean and autoclaved.
- Soak the contaminated linen in big plastic drums with chlorine 5% solution minimum for 10 minutes to decontaminate the linen.
- Rinse in cold water to prepare for autoclaving.
- Dry in the sun.
- Send for autoclaving to make it safe for use.
- Use sterile autoclaved draw sheets.
- See that the frocks for infants are in soft cloth and used only after washing and autoclaving.

16) **Disinfect the cotton gauze** by autoclaving as and when required.

17) **Wash everyday the swab container, injection and medicine tray** with soap and water/autoclave. Use separate swab containers for each baby.

18) Autoclave **sets for procedures** after each use (every 72 hours if not used).

19) Autoclave **cheattle forceps** daily. Put in sterile autoclaved bottle containing dry sterile cotton.

20) Autoclave **steel drums** after use and every 48 hours.
21) Cleaning and disinfection of furniture

- Wipe the dust on furniture using a piece of dry, clean, soft cloth daily, followed by damp dusting.
- Wipe any water or chemical from the polished surface of furniture to avoid stains and damage to the polished surface.
- Disinfect iron, steel, plastic furniture and incubators using 2% Glutaraldehyde, 2% Savlon every day.
- Trolleys, lockers, I/V stands, examination tables should be disinfected daily.

### 10.8 BIO-MEDICAL WASTE MANAGEMENT

Bio-medical waste management is an integral part of infection control. Proper disposal of hospital waste is important to keep the environment clean. The waste should be disposed off in a proper way. All health professionals should be well conversant with their local hospital policies for waste disposal which may vary from place to place.

The following are different colour drums with different colour polythene for different type of waste, to be disposed off in different ways.

- **a) Black Drum/Bag**
  - Left over food, fruits, feeds, vegetables, waste paper, packing material, empty box, bags etc. This waste is disposed off by routine municipal council committee machinery.

- **b) Yellow/Red Drum/Bag**
  - Infected non-plastic waste e.g. human anatomical waste, blood, body fluids, placenta etc., and this type of waste requires incineration.

- **c) Blue Drum/Bag**
  - Infected plastic waste such as used disposable syringes, needles (first destroy the needle in the needle destroyer).
  
  Used sharps, blads and broken glass should be discarded in puncture proof containers before discarding.
  
  I/V sets, blood transfusion set, endo-tracheal tube, catheter, urine bag etc. should be cut into pieces and disposed in blue bag. This waste will be autoclaved to make it non-infectious. This is then shredded and disposed off.

### 10.9 ACTIVITIES AND GUIDELINES

**Activity 1**

- Observe the aseptic technique during your placement in nursery.
- Practice hand washing technique
- Practice use of mask, gown and gloves
- Use various disinfection procedures for various equipments during care of baby.
10.10 LET US SUM UP

This practical section on infection prevention dealt with the sources of infection, principles of infection prevention, procedure for entering nursery, types of various disinfectants used in nursery, instructions for using disinfectants, cleaning and disinfection of patient care area and equipment.

This practical will help you to learn the skills required for cleaning and disinfecting patient care area and equipment.