



**Guidelines on Infection Prevention and Standard Precautions for
Cleaning and Disinfection Procedures in Schools and Childcare Settings
during an Infectious Disease Outbreak**

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Guidelines on Infection Prevention and Standard Precautions for Cleaning and Disinfection Procedures in Schools and Childcare Settings during an Infectious Disease Outbreak

Standard precautions should be adopted at all times and frequently reminded during an infectious disease outbreak. These precautions should be used as a first-line approach to preventing infection and should be adopted for contact with all body fluids. Gloves are worn to prevent contact with broken skin, moist mucous membranes, and body fluids; masks and eye protection are worn when there is a chance of splashing body fluids into the eyes, nose or mouth; gowns are worn if there is a chance that clothing may become soiled with body fluids. Precautions also include proper disposal of contaminated equipment and good hand washing practices.

These precautions include:

- Hand hygiene
 - Respiratory and cough hygiene/etiquette
 - Use of personal protective equipment (PPE) where appropriate
 - Appropriate cleaning and disinfection of contaminated items
 - Appropriate handling and disposal of infectious waste.
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1. Hand Hygiene

- Hand washing is one of the most important measures in preventing spread of infection.
- Mild liquid soap should be available at hand basins. Antiseptic soaps are not necessary and may irritate some skin types. Liquid soap dispensers should be fitted in preference to bars of soap.
- Paper towels or air dryers should be available at hand basins for drying hands and in other relevant areas for general drying and cleaning.
- Communal cloth towels should not be used.
- A copy of the picture on Hand Washing Techniques (**Appendix 1**) should be laminated or placed in a plastic sleeve and placed on the wall adjacent to washing facilities.

Hands should be washed using soap and water and then dried:

- Before handling, preparing or eating food
- Before and after assisting students with eating/meals
- Before and after assisting students with toileting
- Before and after providing first aid or medication
- Before and after touching an ill or injured person
- After touching body fluids
- After removal of protective gloves
- After a diaper change, or using the toilet
- After touching animals/pets
- After playing the sand, or whenever their hands become soiled after playing

Alcohol-based hand rubs may be used routinely as an alternative; however, the safety issues, including flammability, skin reaction and student access to the product (i.e. ingestion) must be considered. It is recommended that alcohol-based hand rubs have a minimum of 70% alcohol. This amount has proven to be effective in significantly reducing germs. Hand rubs should be used when soap and water are unavailable. Hand rubs are not to be used if hands are visibly soiled with dirt or other contaminated material (e.g. blood, vomit, stool, urine).

2. Respiratory Hygiene/ Cough Etiquette

Respiratory hygiene / cough etiquette is regarded as a kind of source control measure. Staff and students alike should be educated to perform the following when they cough or sneeze:

- Cover mouth and nose when coughing or sneezing.
- Use tissue paper to contain respiratory secretions and dispose them promptly in lidded receptacles.
- Perform hand hygiene after hands have been in contact with respiratory secretions.
- Provide surgical masks to persons with respiratory symptoms when tolerated, especially during epidemic.
- Isolate sick staff or students at a designated area (eg, sick bay) and send them home or wait until they are picked up by their parents/guardians. Advise to seek medical attention at the nearest health centre.

3. Diaper Changing and Toileting Care (eg, Childcare Centres, Kindergartens)

Care staff need to be very careful when diapering or helping a child use the toilet. There should be designated diaper changing area located close to a sink and separated from the food preparation area. Areas such as couches, play areas should not be used for diaper changing.

Diapering surfaces should be smooth, non-absorbent and easy to clean. Recommended materials for the surface include formica, metal and plastic; rough/ porous surface e.g. unsealed cement should be avoided as maintenance will be difficult and subsequent chances of contamination will be higher.

Required materials should be organised within reach and this include: fresh diaper and clean clothes, disposable baby wipes or dampened paper towels for cleaning the child's bottom, gloves and disposable bags for rubbish.

Surfaces should be cleaned and disinfected after each diaper change. Disposable diapers are to be discarded into covered trash bins. Hand hygiene should be performed by both the staff and child after diaper changing or visiting the toilet.

The following diaper-changing steps are recommended for staff:

1. Place disposable paper towels or any other disposable covering on the portion of the diapering table where you will place the child's bottom.
2. Put on disposable gloves and apron (if needed).
3. Using only your hands, pick up and hold the child away from your body. Prevent cradling the child and risk soiling your clothing.
4. Lay the child on the diapering table.
5. Unfasten the soiled diaper, but leave it under the child.
6. Clean child's bottom using disposable baby wipe or dampened paper towel.
7. Fold the soiled diaper surface inward. The potentially contaminated diaper should be wrapped in a plastic bag, tied securely before being discarded into a plastic-lined foot-operated lid bin.
8. Slide a clean diaper under the child and adjust it.
9. Dispose of any paper towels on the diapering table and clean any visible dirt from the table. Dispose the gloves /apron.
10. Disinfect the diapering table with household bleach (1 part bleach with 9 parts water).

4. Bathing and Tooth Brushing

Bath towels must not be shared. Individual bath towels may be provided either by the centre or brought from home. Bath towels should be labelled for identification and stored in an area where the children can retrieve them easily. Toothbrushes must not be shared. Each child must have his/her own toothbrush and toothpaste which is clearly labelled with her his/her name.

5. Wounds

Keep wounds covered (e.g. with a water-resistant dressing).

6. Use of PPE, Facilities and Materials

The use of personal protective equipment (PPE), facilities and materials is required to prevent or minimise the spread of infection, illness and disease. The following PPE, facilities and materials should be readily available in the schools/childcare centres, particularly in food preparation, first aid, and special and physical education areas:

- Hand-basins in or near toilet facilities, first aid and food preparation areas.
- Disposable gloves and plastic aprons for all situations involving contact with body fluids (Gloves should be powder-free latex or vinyl). Food handling type gloves do not provide adequate protection. Disposable gloves are for single-use only and are not to be re-used.
- Waste handling equipment e.g. a pair of sturdy tongs for handling potentially infectious waste.
- Leak-proof sealable plastic bags for disposal of potentially infectious waste.

- Rigid-walled, puncture-resistant container such as a sharps container for disposing of “sharps” e.g. used needles or syringes (Sharps disposal kits containing a small sharps container, disposable gloves and band-aids, plastic disposable tweezers, and an antiseptic cleaning tissue, may be purchased. Note that plastic tweezers are not recommended for handling used needles and syringes as these can cause the sharp to flick and cause injury).
- Use lidded (pedal) trash disposal bins containing a sealable plastic lining.
- If there is a risk of discarded needles and syringes; leather or puncture-resistant gloves should be provided to at-risk staff such as school cleaners, and Schools Officers.

Relevant PPE, facilities and materials should be used during the following:

- Handling or preparing food (to avoid latex contamination of food, do not use latex gloves for food handling and preparation).
- Administering or assisting with first aid or medication (First aid staff, facilities and equipment should be provided in accordance with the relevant departmental procedure for first aid.)
- Assisting a student to change clothing soiled with blood or body fluids (including excreta such as urine and faeces), using the toilet to change sanitary pads and soiled clothing.
- Assisting a student in feeding involving potential contact with saliva.
- Administering medication into the feeding gastrostomy tube.
- Handling or disposal of potentially infectious waste such as when cleaning and disinfecting blood or body fluid spills.
- Emptying or disposal of containers of potentially infectious waste such as rubbish or soiled dressings.
- On playground duty, bus duty or similar work activity, it is recommended that staff carry a pair of disposable gloves in case they need to attend to an ill or injured student.
- If general waste is to be picked up, it is recommended that gloves and waste collecting equipment (e.g. a pair of sturdy tongs) be used to protect against injury from concealed sharps, and to prevent direct contact with soiled items such as used tissues.

7. Cleaning and Disinfection

Cleaning works by using detergent and water to physically remove dirt and impurities from surfaces or objects. Cleaning does NOT kill germs.

Disinfection works by using disinfectant to kill germs on surfaces or objects. In order for a disinfectant to work properly, a dirty surface should first be cleaned with detergent and water. Disinfectants will not work properly without first removing the dirt and other impurities.

Cleaning and disinfection should be increased during an outbreak:

- Immediately after spills of body fluids:
 - Discard fluid contaminated material in a plastic bag that has been securely sealed
 - Mops should be cleaned, rinsed with a disinfecting solution, wrung as dry as possible and hung to dry completely.
 - Change mop heads when a new bucket of cleaning solution is prepared, or after cleaning large spills of emesis or fecal material.

2. Frequently touched surfaces including toys, cribs, tables, lavatory surfaces, changing stations, cubbies, mats, blankets/sheets, keyboards, kitchen prep areas, desks, phones, handrails, doorknobs and equipment in the immediate vicinity of children.
3. Common areas such as gym, cafeteria, restrooms

Clean and disinfect using proper techniques and disinfection guides below.

Do not use a common cloth for cleaning/disinfecting; use paper towels and dispose of them immediately after use.

Chlorine (Sodium Hypochlorite) / Bleach – is a safe, inexpensive and effective disinfectant when diluted appropriately. Concentrated chlorine can come in liquid, powder or tablet form. Chlorine is commonly used in hospitals for more intensive environmental disinfection.

Certain precautions must always be adhered to when using chlorine, including the following:

- Dilute and use chlorine solution in a well-ventilated area; i.e. open all windows and doors.
- Never use concentrated chlorine. Always dilute the chlorine according to the instruction of the vendor / manufacturer.
- Never combine chlorine with other chemical or detergent, especially acids (such as vinegar) or ammonia. Mixing chlorine with other products can produce toxic gas.
- Wear appropriate personal protective equipment such as gloves, apron and face mask when using chlorine.
- Never use a spray bottle to avoid aerosolizing of the chlorine solution. Using a “pump” or “pour” bottle is preferred. Diluted chlorine solution should be prepared daily. Discard any diluted chlorine solution at the end of the day. Diluted chlorine breaks down quickly and it will be ineffective if used the next day.
- Opened bottles of concentrated liquid chlorine should be discarded after 30 days.
- If a splash occurs to the eyes/noses/mouth, flush with water immediately.
- Keep chlorine out of reach from children. Toys and other items disinfected with chlorine should also be kept out of reach from children until dry.
- As disinfectants come in varying strengths, please follow the manufacturer’s instructions on dilution and contact time.
- Areas that are heavily soiled with body fluids (e.g. diaper changing areas) will require more frequent cleaning and disinfection than areas that are minimally soiled or not soiled (e.g. offices).

- Adopting a colour coding for cleaning of the environment and cleaning equipment is based on best practice. All cleaning items, for example, cloths (re-usable and disposable), mops, buckets, aprons and gloves, should be colour coded to reflect the different areas within the centre.

Table 1: Dilution guide when using aqueous chlorine solution of 5.25% to 6.15% sodium hypochlorite (e.g. household bleach)

Surfaces	Dilution ratio	Strength
Excrement-soiled surfaces	1 part bleach to 9 parts water (1:10)	Strong
General surfaces	1 part bleach to 49 parts water (1:50)	Normal
Surfaces in contact with food/mouths	1 part bleach to 249 parts water (1:250)	Weak

Table 2: Disinfection Guide

No.	Item & recommendations	Disinfection steps	Remarks
1(a)	<p><u>Communal toys</u></p> <p>Communal toys that are shared between ‘children’</p>	<p>Disinfect at least daily or at the end of every session.</p>	<p>The used toys should be segregated in an empty basin that is out of the children’s reach until disinfected and dried.</p>
1 (b)	<p>Any toy that is contaminated by saliva, stool, blood or body fluids.</p>	<p>Wash with soap and water and wipe with antiseptic wipes before being handled by other children.</p>	<p>Toys that are allowed: Washable toys, toys with hard surfaces that can be easily disinfected by wiping with antiseptic wipes. Diapered children should be given only washable toys.</p> <p>Individual toys belonging to the ‘child’ are to be cared for by his/her own family. These toys are not shared with other ‘children’ and are to be kept with the child. Toys that are brought from home should not be shared with other children.</p>
1(c)	<p>All washable toys should be cleaned daily.</p>		
1(d)	<p>Immersible toys are toys with no moving parts, no hollow spaces and a non-porous surface and they will not soak up water into closed cracks or spaces (e.g. stacking cups, Lego blocks).</p>	<p>Disinfect as follows:</p> <p>Immerse in warm soapy water, wash surfaces, rinse in clean water and dry. Disinfect by submerging in household bleach diluted 1 part of bleach with 49 parts of water and air dry.</p> <p>OR</p> <p>Wipe surface of toy thoroughly using alcohol impregnated wipe</p>	

No	Item & recommendations	Disinfection steps	Remarks
1 (e)	Non-immersible toys – toys with inside spaces, small openings or hinges (e.g. robots, cars) or are too large to be immersed (e.g. slides, castles).	Wipe surface of toy thoroughly using alcohol impregnated wipe. Clean all the nooks and crannies.	
(f)	Uncleanable toys – toys that can soak up water and are damaged by immersion (e.g. games, soft books, puzzles, activity books, crayons, stuffed toys). Use is discouraged.	NA	Use is discouraged
(g)	Board games are allowed provided the parts can be easily disinfected. Cards / false money e.g. Monopoly etc. should be laminated to allow for easy disinfection.		
(h)	Toys that are not allowed: Stuffed toys (unless disinfected by high temperature washing), toys that resemble food items (as children will be more inclined to place them in their mouths) or non-washable toys.	NA	Such items are prohibited
2	Utensils and milk bottles	Used milk bottles and teats are to be washed and sterilized, using the sterilizer, immediately after use.	Sterilization of utensils, teats and milk bottles

No	Item & recommendations	Disinfection steps	Remarks
3	Soiled clothing	Soiled clothing should be placed into a separate pail which should not be used for any other purpose. The pail should be stored in a designated place. This pail should be disinfected after each use.	Clothing soiled with urine or stool is to be rinsed at the centre. It should be done in a pail designated or this purpose in the centre. The soiled clothing should be packed in plastic bags to minimize exposure of staff and children to disease-carrying agents. Hands should be washed after handling soiled clothing.
4	Diaper-changing areas	Disinfect with a solution of household bleach diluted 1 part of bleach with 9 parts water.	Diaper-changing surfaces should be sanitized between uses. Alternatively, the diaper changing surface should be covered with disposable paper pads, which are discarded after each use. If the surface becomes wet or soiled, it should be cleaned and sanitized.
5	Potty chair – the use of potty chairs should be discouraged. However, if used, potty chairs should be emptied into the toilet, cleaned in a utility sink, and disinfected after each use.	Disinfect with a solution of household bleach diluted 1 part of bleach with 49 parts of water in a utility sink. After 2 minutes contact time with the bleach, rinse and dry.	

No	Item & recommendations	Disinfection steps	Remarks
6(a)	<p><u>General Surfaces</u></p> <p>Floor, low shelves, doorknobs and other surfaces often touched by diapered children</p>	<p>Wash and disinfect daily with household bleach diluted 1 part of bleach with 49 parts of water.</p>	<p>The disinfecting cloth should not be washed in a sink used for washing hands. If it is, all surfaces of the sink should be properly cleaned and disinfected with diluted household bleach (1 part bleach with 49 parts water) after use.</p>
6(b)	<p><u>Cleaning of Horizontal Surfaces</u></p> <p>Uncarpeted floors and other frequently touched horizontal surfaces (e.g. tables, door knobs)</p>	<p>Clean regularly and if spills occur.</p>	
6(c)	<p>Carpeting</p>	<p>Vacuum regularly & cleaned if spills occur and given a shampoo whenever a thorough cleaning is indicated.</p>	

No	Item & recommendations	Disinfection steps	Remarks
7(a)	Centre premise	Wash and disinfect daily with household bleach diluted 1 part of bleach with 49 parts water	Clean and disinfect 2 to 3 times throughout the day to provide a clean and safe environment.
7(b)	Toilet & bathroom facilities	Clean toilet twice daily and disinfect highly touched areas e.g. taps, door handles, toilet seat with their disinfectant solution after cleaning. Wipe down also high touch surfaces (e.g. table surfaces and shared toys) with disinfectant solution.	
7(c)	For surfaces in bathroom like faucet handles and toilet seats	Wash and disinfect with diluted household bleach (1 part of bleach with 49 parts of water) at least once a day.	
7(d)	Surfaces that infants and young toddlers are likely to touch.	Wash daily and disinfected with diluted household bleach (same dilution)	

No	Item & recommendations	Disinfection steps	Remarks
8	Mattress covers	Warm water and detergent	Should be used only by a single child and should be cleaned and sanitized before being assigned to another child.
9	Bedding sheets and blankets	Warm water and detergent	Should be assigned to each child and cleaned and sanitized when soiled or wet.
10	Cleaning Walls, Blinds and Curtains	Routine daily cleaning of walls, blinds and curtains are not recommended unless visibly soiled.	

Note: Depending on the varying strength of the disinfectant product, please follow the manufacturer's instructions for dilution.

It is strongly recommended that child care / school operators use only disinfectants that are recommended by internationally-recognized organizations. One such organization is the United States Centers for Disease Control and Prevention (*you could see a list of their recommended disinfectants by visiting <https://www.cdc.gov/infectioncontrol/guidelines/disinfection/disinfection-methods/chemical.html#>*).

Operators should be aware of the disinfectant's effectiveness in killing specific germs and how to use it safely.

If a child care / school operator wishes to use a disinfectant that is not listed by any internationally-recognized organizations, they should evaluate the disinfectant by requesting the vendor / manufacturer to provide relevant research papers to prove the product's efficacy. It is also advisable to have a person who is competent in understanding research papers to evaluate the product.

8. Handling and disposal of infectious waste

Infectious waste refers to the waste containing substances or microorganisms that can transmit infectious diseases. Appropriate handling and disposal of potentially infectious waste is very important in preventing or minimising the spread of infection, illness and disease. When cleaning and disposing of potentially infectious waste such as body fluids, or items containing these products, such as bloodstained items or soiled clothing, the following points should be taken:

- Wear disposable powder-free latex or vinyl gloves, and a plastic apron if necessary. Eye protection is recommended as additional personal protective equipment (PPE) when managing blood and body fluid spills.
- For vomitus or faeces
 - i. Immediately absorb the bulk of the spill with disposable materials such as paper towels.
 - ii. Clear other persons away from the area.
 - iii. Clean and decontaminate area. Staff is to wear disposable gloves and apron/gown to remove material for safe disposal (plastic dustpan may be used)
 - iv. Area and equipment must then be disinfected with 1 in 50 dilution of household bleach (1 part bleach to 49 parts water). All cloths used are to be thrown away later.
 - v. For food contact surfaces, clean with detergent and water, using a disposable cloth, followed by disinfection by wiping down with 1 in 50 dilution of household bleach (1 part bleach to 49 parts water).
 - vi. Soiled carpets and soft furnishing should be cleaned with water and detergent or carpet shampoo. Steam cleaning may be used as an alternative on soft furnishings (if material can withstand cleaning with steam).
- Special care should be taken if waste contains sharp materials such as broken glass. Sharp material should be picked up with sturdy tongs, and wrapped securely in several layers of newspaper or put into a puncture resistant rigid-walled container such as a sharps container.
- Clean the spill with water and detergent, followed by disinfecting the area with freshly prepared solution of diluted household bleach (1 part bleach with 9 parts water). Leave the bleach disinfectant on the affected area for at least 21 one minute then clean the entire area again with soap and water, and leaving the area to dry. For small spills (e.g. spots of blood), an alcohol impregnated wipe may be sufficient.
- Clean equipment such as mops and buckets with water and detergent and dry in an open area. Dispose the mop head if it is heavily contaminated.
- Remove and dispose of gloves and other waste such as paper towels into a sealable plastic bag. Dispose of the sealed plastic bag properly.
- Wash hands thoroughly with soap, water and dry with paper towels.
- If the spill is on the carpet, clean with a detergent and arrange for the carpet to be cleaned with an industrial cleaner as soon as possible.
- If staff or students find potentially infectious waste items, such as used needles and syringes, they should immediately inform the relevant staff. Where possible, an adult should remain with the item while another

retrieves appropriate handling and disposal equipment. No attempt should be made to recap, break or bend the needle as this is a common cause of injury.

- In the event of a needle stick injury or other injury involving exposure to blood or body fluids during handling and disposal of potentially infectious waste, the person should be sent for medical assessment as soon as possible.

9. Handling of Spillage

Disposable gloves should be used if the cleaning involves contact with body fluids, such as respiratory secretions, urine, feces etc. Eye protection (i.e., goggles and faceshield) or body protection may be considered when substantial splash of blood or body fluids is anticipated. Use highly absorptive materials to preliminarily clean up the contaminated surfaces first. If the surface is contaminated with vomitus or other body fluids, disinfect with 1 in 49 diluted household bleach (5.25%) solution, leave for 15-30 minutes and then rinse with water; if the surfaces are contaminated with blood, use 1 in 4 diluted household bleach (5.25%) solution for disinfection of the contaminated surface and leave for 10 minutes before rinsing with water.

10. Floors and Floor Coverings

Carpets or rugs/mats may be vacuumed using a cleaner that does not throw dust into the air or steam cleaned if soiled with body fluids. Do not hang up and swat carpets or rugs/mats as this will create aerosols. Hard floor surfaces should be cleaned with wet vacuum systems. If wet vacuum systems are not available, hard floor surfaces should be damp mopped using detergent and water or disinfectant if necessary.

11. Lift cars and escalators

Wipe lift cars and escalators, particularly the call buttons and handrails with detergent and water, or disinfected with 1 in 99 diluted household bleach (5.25%) solution, if necessary. Clean lift ventilation fans regularly.

12. Atrium/lobby areas

Regularly wash and wipe building entrances, door knobs/ handles with detergent and water, or 1 in 99 diluted household bleach (5.25%) solution, if necessary.

13. Public Toilets

Clean public toilets with 1 in 99 diluted household bleach (5.25%) solution frequently. Every public washroom should be equipped with liquid soap, paper towels or hand dryer(s). Clean toilets of the guest rooms at least once a day. Wipe the rim, seat and lid of the toilet bowl with 1 in 99 diluted household bleach (5.25%) solution, rinse with water and then wipe dry. Make sure that the drain pipes are built with U-shaped water traps; do not alter the pipelines without authorization. Clean floor drain outlets at least once a week to prevent putrid air and insects in the soil pipes from entering the premises. Pour about half a litre of water into each drain outlet regularly (about once a week) so as to maintain the water column in the pipe as water lock.

Environment decontamination is crucial when: Under outbreak situation disinfect the environment with 1 in 49 diluted household bleach (5.25%) solution, leave for 15-30 minutes before rinsing with water and mopping dry. [28] Special attention should be paid to the disinfection of toilets, kitchens and objects which are frequently touched such as light switches, door knobs and handrails.

Transmission-based Precautions

There are three categories of Transmission-based Precautions: Contact Precautions, Droplet Precautions, and Airborne Precautions. For some diseases that have multiple routes of transmission (e.g., SARS), more than one Transmission-based Precautions category may be used. When used either singly or in combination, they are always used in addition to Standard Precautions. Contact precautions are designed to reduce the risk of infectious diseases transmission by direct or indirect contact when handling of infective materials such as changed linen sheets. Appropriate PPE should be worn, in accordance with Part 4 in the above, when contact with sick guests or contaminated environmental surface or items is anticipated. Droplet precautions are designed to reduce the risk of droplet transmission of infectious agents (e.g., influenza, rubella, SARS etc) while airborne precautions are designed to reduce the risk of infectious diseases, such as pulmonary tuberculosis and chicken pox, transmitted by small droplet particulates (i.e. droplet nuclei).

Ventilation

This refers to the process of supplying and removing air to and from a building, which could be achieved by natural and mechanical means. Natural ventilation is usually characterized by uncontrolled inward and outward air leakage through cracks, windows, doorways and vents. Premises relying entirely on natural ventilation should have openings of at least 5 to 10% of the floor area to obtain adequate ventilation. Mechanical ventilation is provided by air movers or fans in the wall, roof or air-conditioning system, which promotes supply and exhaust air flow in a controllable manner.

Purpose of Ventilation

Provide fresh and clean air to maintain a thermally comfortable work environment, and to remove or dilute airborne contaminants. Maintain the temperature and humidity within acceptable range.

General Ventilation Design

Good air flow is very important. Adequate ventilation can maintain the freshness of air, prevent accumulation of heat and control the level of airborne contaminants. Carbon dioxide level of higher than 1,000 ppm may indicate the insufficiency of indoor ventilation. The location of fresh air intake points should be carefully designed to prevent intake of contaminated air. Optimum temperature of 20°C – 26°C. Optimum humidity of 40% - 70%. Avoid blocking of air flow from the supply registers. Too much air movement causes draughts which are annoying, if too little, people may complain of stuffiness. Adjust diffusers and return air grilles properly. Regular maintenance to keep the ventilation system clean and functioning properly.

Infection Control Measures and Ventilation Issues

Microorganism such as mould or fungi, bacteria, viruses, protozoa etc can be found indoors. Mould or fungal growth on structural materials is a sign that biological growth in the area is flourishing. High air humidity, stagnant water, filters packed with dusts and building structures that have been damaged by moisture all provided favorable conditions for biological growth. Use efficient filters in ventilation unit to remove airborne particulates and spores of microorganisms from the ventilation system. Remove potential water sources that may encourage fungal growth, especially stagnant water in ventilation systems. Repair and maintain all water pipes and draining systems. Repair areas that have been affected by flood or seepage. Remove and replace contaminated porous materials, such as heavily deposited ventilation unit filters, moldy ceiling tiles and mildewed carpets. Disinfect all smooth surfaces (such as wall tiles) that have been contaminated by fungi. Provide dehumidifier units for control of humidity within the optimum range.

Maintenance of Mechanical Ventilation Systems

Proper inspection, cleaning, testing and maintenance schedules should be drawn up and followed. Replace air filters regularly. Inspect all components of the ventilation system for cleanliness and microbial growth regularly, and clean them as required. Test the performance of the system against the design specification and make necessary adjustment or repair. If water cooling towers are used, they should be so maintained, e.g., use of biocides as appropriate, as to prevent the growth of micro-organisms. Ventilation system should function properly and be regularly maintained. Air-conditioning systems should be cleaned according to the manufacturer's instructions. Filters should be changed or cleaned according to the manufacturer's instructions. Staff should put on appropriate PPE (such as goggles and gloves etc) when changing the filter. Grilles and air ducts should be cleaned regularly.

Use of disinfectants: alcohol and bleach

Different countries have different disinfection protocols. Health-care facilities with limited resources may not have access to a variety of hospital disinfectants, however, alcohol and bleach are acceptable chemical disinfectants if used appropriately. As with any other disinfectants, soiled surfaces need to be cleaned with water and detergent first.

1. Alcohol

Alcohol is effective against influenza virus (252). Ethyl alcohol (70%) is a powerful broad- spectrum germicide and is considered generally superior to isopropyl alcohol. Alcohol is often used to disinfect small surfaces (e.g. rubber stoppers of multiple-dose medication vials, and thermometers) and occasionally external surfaces of equipment (e.g. stethoscopes and ventilators). Since alcohol is flammable, limit its use as a surface disinfectant to small surface-areas and use it in well-ventilated spaces only. Prolonged and repeated use of alcohol as a disinfectant can also cause discoloration, swelling, hardening and cracking of rubber and certain plastics.

2. Bleach

Bleach is a strong and effective disinfectant – its active ingredient sodium hypochlorite is effective in killing bacteria, fungi and viruses, including influenza virus – but it is easily inactivated by organic material. Diluted household bleach disinfects within 10–60 minutes' contact time (see Table G.1 below for concentrations and contact times), is widely available at a low cost, and is recommended for surface disinfection in health-care facilities. However, bleach irritates mucous membranes, the skin and the airways; decomposes under heat and light; and reacts easily with other chemicals. Therefore, bleach should be used with caution; ventilation should be adequate and consistent with relevant occupational health and safety guidance. Improper use of bleach, including deviation from recommended dilutions (either stronger or weaker), may reduce its effectiveness for disinfection and can injure health-care workers.

Procedures for preparing and using diluted bleach:

To prepare and use diluted bleach:

- use a mask, rubber gloves and waterproof apron; goggles also are recommended to protect the eyes from splashes;
- mix and use bleach solutions in well-ventilated areas;
- mix bleach with cold water (hot water decomposes the sodium hypochlorite and renders it ineffective);
- if using bleach containing 5% sodium hypochlorite, dilute it to 0.05%, as shown in Table G.1 below.

Table 3: Sodium hypochlorite: concentration and use

<u>Starting solution</u>
Most household bleach solutions contain 5% sodium hypochlorite (50 000 ppm available chlorine).
<u>Recommended dilution (except if stated otherwise as above)</u>
1:100 dilution of 5% sodium hypochlorite is the usual recommendation. Use 1 part bleach to 99 parts cold tap water (1:100 dilution) for disinfection of surfaces. Adjust ratio of bleach to water as needed to achieve appropriate concentration of sodium hypochlorite. For example, for bleach preparations containing 2.5% sodium hypochlorite, use twice as much bleach (i.e. 2 parts bleach to 98 parts water).
<u>Available chlorine after dilution</u>
For bleach preparations containing 5% sodium hypochlorite, a 1:100 dilution will yield 0.05% or 500 ppm available chlorine. Bleach solutions containing other concentrations of sodium hypochlorite will contain different amounts of available chlorine when diluted.
<u>Contact times for different uses</u>
Disinfection by wiping of nonporous surfaces: a contact time of ≥ 10 minutes is recommended. Disinfection by immersion of items: a contact time of 30 minutes is recommended. N.B. Surfaces must be cleaned of organic materials, such as secretions, mucus, vomit, faeces, blood or other body fluids before disinfection or immersion.

Precautions for the use of bleach

Bleach can corrode metals and damage painted surfaces.

Avoid touching the eyes. If bleach gets into the eyes, immediately rinse with water for at least 15 minutes, and consult a physician.

Do not use bleach together with other household detergents, because this reduces its effectiveness and can cause dangerous chemical reactions. For example, a toxic gas is produced when bleach is mixed with acidic detergents, such as those used for toilet cleaning, and this gas can cause death or injury. If necessary, use detergents first, and rinse thoroughly with water before using bleach for disinfection.

Undiluted bleach emits a toxic gas when exposed to sunlight; thus, store bleach in a cool, shaded place, out of the reach of children.

Sodium hypochlorite decomposes with time. To ensure its effectiveness, purchase recently produced bleach, and avoid over-stocking.

If using diluted bleach, prepare the diluted solution fresh daily. Label and date it, and discard unused mixtures 24 hours after preparation.

Organic materials inactivate bleach; clean surfaces so that they are clear of organic materials before disinfection with bleach. Keep diluted bleach covered and protected from sunlight, and if possible in a dark container, and out of the reach of children.

References:

1. Guidelines for Cleaning and Disinfection Procedures for Hotels and Residential Institutions for Infectious Disease of Public Health Concern, 2020. Disease Control Division, Ministry of Health, Brunei Darussalam.
2. Infection Prevention Guidelines for Schools and Child Care Centres, 3rd Edition, 2019. Ministry of Health, Singapore. [https://www.moh.gov.sg/docs/librariesprovider5/default-document-library/infection-prevention-guidelines-for-schools-\(primary\)-and-child-care-centre-third-edition-2019.pdf](https://www.moh.gov.sg/docs/librariesprovider5/default-document-library/infection-prevention-guidelines-for-schools-(primary)-and-child-care-centre-third-edition-2019.pdf)
3. New Jersey Department of Health Communicable Disease Service General Guidelines for the Control of Outbreaks in School and Child Care Settings https://www.nj.gov/health/cd/documents/topics/outbreaks/Guidelines%20for%20Outbreaks%20in%20School%20Settings_10.2018.pdf