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As corona virus, the cause of Atypical Pneumonia, rampages over Hong Kong, it has brought unprecedented challenge to the safety and health of the frontline workers in the medical profession, healthcare services, cleaning service and property management. These frontline workers remain steadfastly at their posts during this very difficult time are under the constant threat of the killer virus. The Occupational Safety and Health Council has prepared this Practical Guide to provide guidance on the proper use of personal protective equipment and the sterilizing agents, so that these dedicated workers can protect themselves adequately in the fight against this biological hazard.



1. What is biological hazard?

Biological hazards refer to organisms or organic matters produced by these organisms that are harmful to human health. These include parasites, viruses, bacteria, fungi and protein. In general, there are three major of routes of entry for these micro-organisms into our body, i.e. through the respiratory system, transmission through contact with body fluids of the infected or contact with contaminated objects. The harmful effects posed to human health by these biological hazards are mainly of three types - infections, allergy and poisoning.



2. Occupations and workplaces where people may come into contact with biological hazards

- Medical staff, cleaning staff and laboratory technicians in the medical profession;
- Healthcare services:
- Cleaning services and property management;
- Employees in environmental hygiene services such as liquid waste and rubbish collection and disposal;



- Agriculture, fishery, veterinary services, and manufacturing industries that use plant- or animalbased raw materials, such as paper and paper products, textile, leather and furs and related products;
- Indoor workplaces like entertainment premises, restaurants and hotels, where employees generally work in enclosed areas with central air-conditioning: –

Any microorganism breeding inside the air-conditioning system or cooling towers may spread in the workplace through the air-conditioning system. In the office building,

the furnishing materials like carpets and wall-papers, the potted plants and places that are wet and damp or utensils that hold water are likely to be the breeding ground for microorganisms.







3. Preventive and control measures

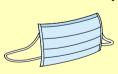
Elimination of the source of contamination is fundamental to the prevention and control of biological hazards. Engineering controls such as improvement of ventilation, partial isolation of the contamination source, installation of negative pressure and separate ventilation and airconditioning system (e.g. in medical wards for infectious

diseases) and the use of ultraviolet lamps can help contain the spread of contaminants. If the contact with biological hazards cannot be prevented, the employees must use personal protective equipment and adhere strictly to the practice of personal hygiene. The personal protective equipment includes

masks, gloves, protective clothing, eye shields, face shields and shoe covers.

4. Respiratory protection

1. Using the appropriate respiratory protective equipment is important for the securing an adequate protection from biological hazards. Common protective equipment includes:



 Surgical masks – Surgical mask generally consists of three layers of non-woven fabrics. It provides a barrier protection against large respiratory droplets;

 N95 or higher level respirators – This type of respirator filters out particulates and liquid droplets in small particle size, therefore providing protection from inhaling aerosols and microorganisms that are airborne.



The selection of particulate respirators should also consider whether the work environment contains oil mists



or fumes and the required filtration efficiency necessary for the protection level. In general, where there are no oil mists or fumes as in a hospital setting, respirators of the N-series with filter efficiency of 95% (Type N-95), 99% (Type N-99) or 99.97% (Type N-100) are suitable. In an environment where there are significant amounts of oil mists, then the R-series, R95, R99 or R100 respirators

(where R stands for oil resistance), or the P-series, P95, P99 or P100 respirators (where P stands for oil proof) should be used.





Particulate respirators with replaceable filters

 Powered Air Purifying Respirator, PAPR. This type of respirator uses an electric blower to bring the air through the filter to the user, making it more comfortable to wear.

Powered Air Purifying Respirator (PAPR)

 Air-supplying respirators. Clean air is supplied by air compressor or high-pressure cylinder through a hose.



2. The type of biological hazard, the nature of work and the work environment will determine the choice of respiratory protective equipment. Adequate training is



required for using the PAPR and the air-supplying respirators to ensure their correct and safe use. It is also necessary to follow the manufacturer's recommendations in the use of these respirators. It is extremely important that the respirator should fit the wearer for a good face seal and the user must perform the seal check to ensure that the respirator is worn correctly for the required protection.

3. How to use disposable masks

Surgical mask offers a barrier protection from respiratory droplets. In the use of the masks, it is important to wear them correctly. When the mask is damp, damaged or soiled, replace it. A surgical mask in general can be used for several hours. If the surface of the mask is touched or the wearer has coughs, the mask needs to be changed more often. After use, the mask should be put in a bag or wrapped with paper before disposal. Wash the hands thoroughly afterwards.



4. Points to note about wearing a surgical mask:

- The mask fits snugly over the face;
- The coloured side of the mask faces outwards, with the metallic strip uppermost;
- The strings or elastic bands are positioned properly to keep the mask firmly in place;
- · The mask covers the nose, mouth and chin;
- Press the metallic strip on both sides of the bridge of the nose to keep the mask snugly over the face;
- Try not to touch the mask once it is worn over the face. If it is necessary to handle the mask, hands must be washed before and after touching the mask.



 Under normal circumstances, a surgical mask should be changed daily. Replace the mask immediately if it is damaged or soiled.



5. Points to note about wearing a N95 mask:

N95 masks are for use in high-risk medical departments such as casualty department, intensive care units, radiology departments (Chest X-Ray examination units) and physiotherapy departments (chest physiotherapy treatment units). Medical personnel that have to take care of high-risk patients or handle high-risk treatment procedures may choose N95 or higher protection level respirators.

- If required to wear N-95 mask, the face-piece must be of proper fit. Compare the size of different brands to find a suitable one.
- Follow the instructions of the manufacturer in wearing the mask:
- To reuse a N95 mask, it should be kept in a paper bag properly before using it again.



- If the N95 mask is soiled or damaged, replace it immediately.
- N95 mask should never be shared with anybody or brought outside the hospital.

N.B: Improper use of the mask may cause discomfort or reduce its level of protection.

N95 masks should not be used by persons:

- suffering from respiratory diseases, such as asthma and emphysema
- having difficulty in breathing or feeling dizzy after wearing it

How to wear a N95 mask



Choose a small or mediumsized face-piece that fits the face. Pull the head bands loose. The metallic strip should be uppermost. Pass the hand through the head bands.



Put on the mask. The head bands should be around the head and neck.



Press the metallic strip on both sides with the forefingers and middle fingers of both hands.



Seal Check:
Positive pressure checking –
cover the mask lightly with both
hands. Breathe with deliberation.
Air should not leak out from the
side of the mask.

Negative pressure checking – cover the mask lightly with both hands. Suck in air with deliberation. The mask should depress slightly inward.

Note: for the masks with valves, check them according to the instruction of the manufactures.



5. Protective clothing

- Protective clothing includes protective coverall (with attached hood), gown, apron, head and shoe covers:
- Protective clothing should be waterproof or impervious to liquids to protect the body from contamination by blood, droplets or other body fluids and prevent these contaminants from getting into the body through open wounds or contaminating the worker's own clothing, thus reducing the chance of spreading of pathogen and cross-infection;



- Protective clothing is disposable in most cases though some can be reused after sterilization;
- Standard protective clothing should be chosen (for example, EU EN 340);
- Protective clothing should fit the wearer and should not hamper movement;

 Protective clothing should be checked before use and replaced if damaged;

 Biologically contaminated protective clothing should be disposed of in specially designed rubbish bag marked with "biological hazard" warning and label.
 Seal the bag and place it in designated location for special disposal;



biological hazard rubbish bag



· How to put on protective clothing:

Take up the gown with the back facing the wearer. Slip the arms through the sleeves first and tie the collar string behind the neck. Then tie the string around the waist:



How to take off protective clothing:
 Loosen the collar string. Slip off the sleeves on both sides and the upper part of the gown. Turn the gown inside out. Roll it outward and dispose.

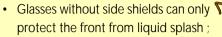


6. Goggles/Face shields

 Safety goggles/glasses and face shields can protect the eyes from contacting pathogen-carrying blood, droplets or other body fluids which may then enter the body through the mucosa;



 Standard goggles should be chosen (for example, EU EN 166; U.S. ANSI Z87.1-1989);





 Goggles fit the face snugly and therefore are better than glasses in eye protection;

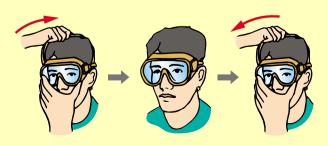


 If necessary, face shield should be used to protect the whole face;



- Both face shields and goggles/glasses should be cleaned with liquid soap regularly. If contaminated by blood, they should be soaked in 1:49 diluted liquid bleach and then rinsed with clean water. Place them in plastic bags after wiping dry and store them in a cabinet:
- Check them regularly. Replace them if out of shape, cracked, scratched or fogged;
- How to put on goggles:
 Hold the goggles with
 one hand and place
 them in front of the
 eyes. Put the head
 band around the head
 and adjust to fit.
- How to take off the goggles:

Hold the goggles lightly and slip off the head band. Keep the goggles in a proper place or sterilize them.





How to put on a face shield:

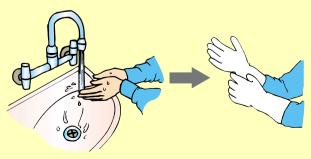
Before use, assemble the face shield according to instructions given by the manufacturer. The way to put on and take off a face shield is similar to that of goggles.

7. Gloves

pathogen;



- Gloves protect the hands from contacting blood, droplets, body fluids and other body tissue of the infected, or pathogen-contaminated objects and can avoid infection when touching the eyes, mouth or nose afterwards.
 Gloves can also protect open wounds from contamination by
- Most gloves are disposable after use;
- Standard gloves should be chosen (for examples, EU EN 374; U.S. ASTM F1670, ASTM F1671);
- Check whether the material used for the gloves is resistant to chemicals. Ask for details from the gloves suppliers;
- Gloves should fit the hands snugly but they should not hamper movement or affect sensibility;
- Keep the nails short to avoid piercing the gloves;
- Two pairs of gloves might be worn in handling highly hazardous substances:
- Wash hands thoroughly before and after use;





Check if there is any puncture before use. To do so, roll up the open end of the glove to see if it can trap air inside (see diagrams below). A punctured glove should be replaced immediately. (N.B: Do not blow the glove directly to avoid direct contact of the mouth and nose with the glove.);

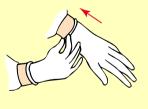




Fold the open end of the glove and roll it up to trap air inside.

An inflated glove means that air is trapped inside and there is no puncture.

- Contaminated gloves should be disposed of in special rubbish bag marked with "Biological hazard" warning and label. Fasten the bag and place it in a designated location for special disposal;
- How to put on gloves: put them on before handling any blood or objects with potential biological hazards. Wear a pair that fits the hands and appropriate for the job;



 How to take off gloves: change or take off the gloves every time after contacting a patient or handling laboratory specimens. Disposable gloves should never be reused. To take off the gloves, grab the rim of the left glove with the right hand and then pull it off away from the body to turn it inside out. Then use the inside of the left glove to cover the right glove and peel it



off gently. Dispose the gloves. In this way, there will be no skin contact with the outside of the gloves.



8. Shoe covers

- Shoe covers prevent pathogens from being carried outside the workplace;
- Shoe covers are usually disposable after use;
- Boot covers offer further protection. Cover the boots with the trousers of protective clothing to prevent contaminants from getting into the boots;
- Shoe covers should be water resistant and skid proof;
- The size should fit so as not to hamper movement.

To ensure their protectiveness, all personal protective equipment requires correct selection and use, as well as proper maintenance and storage. Re-useable protective equipment should be cleaned and sterilized thoroughly before they are used again. Damaged items should be replaced immediately.

When using the complete set of protective equipment, medical personnel should follow strictly hospital guidelines on infection control. Other general frontline workers such as cleaning staff should refer to the following order in putting on protective equipment. However, this



order has to be adjusted according to the work environment to prevent cross-contamination.

The sequence to put on a general full set of protective equipment:

The sequence to take off protective equipment:

The items taken off should be disposed of in special rubbish bag marked with "Biological hazard" warning and label. Fasten the bag and place it in a designated location for special disposal.

9. Sterilization

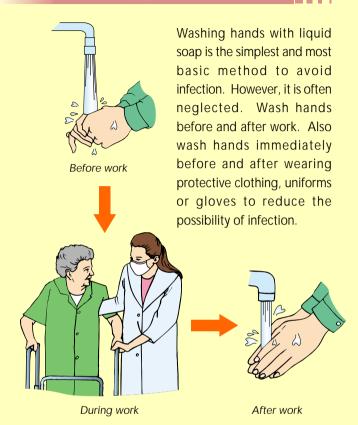
Sterilization is the process using ultra heat or high pressure to eliminate bacteria, or using biocide to eliminate microorganisms, including spores in bacteria. A complete sterilization process should include disinfecting the contaminated premises and thorough cleaning of any residual toxic substances, to ensure that employees would not be harmed through exposure in the risk area. Effective sterilization depends on the strain and amount of microorganisms, the level of organic material present, the properties of the organisms to be eliminated, and the duration, temperature and concentration of the sterilizing agent. Sterilization must be carried out by following strictly safety guidelines and taking personal protection to safeguard the health and safety of employees. There are many kinds of sterilizing

and antiseptic agents, the most common ones being liquid bleach and rubbing alcohol. Hands must be washed thoroughly after taking off any personal protective equipment.





10. Personal hygiene



11. Conclusion

Biological hazards can kill. Or they may cause discomfort and affect the health and performance of employees at the very least. We have to be vigilant in preventing and controlling biological hazards to make the work environment a safer and healthier place.



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