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PENASIHAT

Datuk Kee Sue Sing
Ketua Pengarah Kimia
Malaysia

SIDANG PENGARANG

Chang Hon Fong
Chang Yit Fong
Raja Subramaniam
Noor Azimah
Ida Haslinda

*Sumbangan artikel dari
kakitangan Kimia
Malaysia sangat dialu-
alukan*

*Sila e-mail kepada :
osh_pj@kimia.gov.my*



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Standard Safety Practices In The Microbiology Laboratory

By : Dr NoorZaleha Bt Awang Salleh
Norizan Bt Jaafar

Introduction

Laboratory personnel working with infectious agents are subject to laboratory-acquired infections as a result of accident or unrecognized incidents. The degree of hazard depends upon the virulence of the biological agent concerned and host resistance. Laboratory acquired infections occur when microorganisms are inadvertently ingested, inhaled, or introduced into the tissues. Laboratory personnel are relatively safe when working with *Haemophilus influenza* and *streptococcus pneumoniae*; however, person who work with aerosolized *Neisseria meningitides* are at increased risk of acquiring a meningococcal infection. The primary laboratory hazard associated with enteric pathogen such as shigella, vibrio or Salmonella is accidental ingestion. Biosafety level 2 (BSL-2) practices are suitable for work involving these agents that present a moderate potential hazard to personnel and the environment. The following requirements have been established for laboratories working in BSL-2 facilities.

- Laboratory personnel must receive specific training in handling pathogenic agents and be directed by competent scientists.
- Access to the laboratory must be limited when work is being conducted.
- Extreme precautions must be taken with contaminated sharp items.
- Certain procedures involving the creation of infectious aerosols or slashes must be conducted by

personnel who are wearing protective clothing and equipment.

Standard microbiological safety practices

The following safety guidelines listed below apply to all microbiology laboratories regardless of biosafety level.

a) Limiting access to laboratory

Sometimes people who do not work in the laboratory attempt to enter the laboratory to look for test results they desire. Although this occurs more frequently in clinical laboratories,

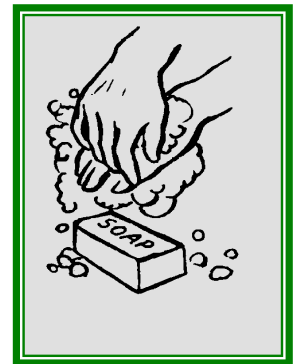
access to the laboratory should be limited, regardless of the setting.

Biohazards signs or stickers should be posted near all laboratory doors and on all equipment used for laboratory work (e. g. incubators, hoods, refrigerators, and freezers.)

Children under 12 years of age and pets are not allowed in laboratory areas. All laboratories should be locked when not in use. In addition, all freezers and refrigerators located in corridors should be locked.

b) Hand washing

Each laboratory should contain a sink for hand washing. Hands should be washed for at least one minute. Frequent hand washing is one of the most effective procedures for avoiding laboratory acquired infections. Hands should be washed with an appropriate germicidal soap before exiting the laboratory and after the infectious materials are handled. (Laboratory personnel working with gram positive organisms should use alcohol (70%) to cleanse their hands if germicidal soap is unavailable).



c) Eating



Eating, drinking and smoking are not permitted in laboratory work areas. Food must be stored and eaten outside of the work area in the designated areas used for that purpose only. Personal articles (e.g. handbags, eyeglasses, or wallet) should not be placed on the workstations.

d) Pipetting

It is mandatory not to mouth-pipette a microbial solution, even with a cotton-plugged pipette. Aspiration of organisms into the mouth can occur despite the cotton plug. Blowing out the last few droplets from a pipette can also form aerosols. Use either a manual or automatic pipetting aid to pipette. The discharge of the last few droplets using either manual or automatic pipette aids can result in aerosols, so avoid this if possible. If it is necessary to discharge the entire contents of the pipette try to avoid spraying. For serious pathogens, pipetting should be performed in a biosafety hood. Contaminated pipettes should be discarded into a container containing a sufficient volume of disinfectant to permit the complete immersion of the pipette.

e) Sharps

A high degree of precautions must always be taken with any contaminated sharp items, including needles and syringe, slides pipettes, capillary tubes and scalpels. Dispose of sharps in designated containers. To minimize finger sticks, used disposable needles must not be bent, sheared broken, recapped, removed from disposable syringes, or otherwise manipulated by hand before disposal.



Non-disposable sharps including syringes, should be placed in a labeled discard pan for decontamination before cleaning. Broken glassware should not be handled directly by hand but should be removed by mechanical means (e.g. a brush, dustpan, tongs or forceps).

f) Aerosols

Sources of microbial contamination to the laboratory personnel and others are aerosols production. All procedures must be carefully performed to minimize splashes or aerosolization. Procedures that tend to produce aerosols are as follow:

- i. Inoculation using wire loop
- ii. Preparing of slides
- iii. Streaking of plates
- iv. Pouring of microbial suspension

When procedures with high potential for creating infectious aerosols are conducted or when a procedure is used that can result in splashing of the face with infectious or other hazardous materials, laboratory work should be conducted in safety cabinet or by laboratory personnel wearing the appropriate face protection equipment (e.g. goggles, mask, face shield or other splatter guards). Face protection should also be used when working with high concentrations or large volumes of infectious agents,

g) Decontaminating bench tops and other surfaces

Bench top should be wiped with disinfectant (a phenolic disinfectant), 1% sodium hypochlorite (bleach), or 70 % isopropyl alcohol routinely after working with infectious agents or clinical specimens or after spills, slashes or other contamination by infectious materials. Solutions of disinfectants should be maintained at the work station.

h) Disposal of contaminated materials

All discarded plates, tubes, clinical samples, and other contaminated materials should be placed in disposal containers at each bench. Special disposal boxes must be used for sharps (e.g. syringes or broken glass) to minimize the risk of injury. Avoid overfilling such containers. Containers of contaminated material should be carefully transported to the autoclave room before disposal.

i) Autoclaving

An autoclave must be available for the BSL -2/3 laboratory and must be operated only by personnel who have been properly trained in its use. To verify that each autoclave is working properly, spore strips or other biological indicators

designed to test for efficacy of sterilization should be included in autoclave loads on a regular basis. Each autoclave tape should be monitored with temperature-sensitive tape, thermograph, or by other means (e.g., biological indicator).

j) General laboratory policies

All areas of the laboratory must be kept clean and orderly.



Dirt, dust, crowding, or clutter is a safety hazard and is not consistent with acceptable biological research. Floors should be kept clean and free from unnecessary clutter. They should be washed with germicidal solution on a regular basis and after any spill of infection material has occurred.

k) Refrigerators and freezers

Refrigerators and freezers should be regularly inspected for the presence of broken materials, laboratory personnel should wear gloves and proper protection attire (e.g. laboratory coat, goggles, or face shield). Refrigerators and freezers should be regularly cleaned with disinfectant and defrosted to prevent possible contamination and temperature failure.

l) Fire prevention

Burners should be used away from lamps and flammable materials. Bulk flammable material must be stored in the safety cabinet. Small amounts of these flammable materials (e.g. ethyl acetate, ethyl alcohol and methanol) can be stored in safety containers. Burners must be turned off when not in use. All laboratory personnel must know the location of fire extinguisher, fire blankets and showers, and fire safety instructions and evacuation should be posted. In case of a flammable liquid spill, turn off any source of ignition immediately, such as Bunsen burner or hot plate.

m) Special practices

i) Transport of biohazard materials

Transport of bio-hazardous materials from one building to another increases the risk of breakage and spills. If transport is necessary, the primary infectious agent container (regardless of size) must be placed in an unbreakable second

container that can be sealed (e.g., using a screw cap tube or a plastic bag).

ii) Disinfectants

Organisms may have different susceptibilities to various disinfectants. As a surface disinfectant, 70% alcohol is generally effective for *Enterobacteriaceae*, but other organisms are more resistant. However, 70 % isopropyl alcohol is not the disinfectant of choice for contaminating spills. Phenolic disinfectants, although expensive, are usually effective against many organisms.

Always read disinfectant labels for manufacturers' recommendation for dilution and for exposure times for efficacy, especially before use on BSL-3 organisms. A effective general disinfectant is a 1:100 (1%) dilution of household bleach (sodium hypochlorite) in water; at this dilution, bleach can be used for wiping surfaces of benches, hoods and other equipment. A 1:10 (10%) dilution of bleach is corrosive and will pit stainless steel and should not be used routinely; however, the 10% bleach solution may be used to clean up spills of cultured or concentrated infectious material where heavy contamination has occurred. If sodium hypochlorite is used as a disinfectant, the standard 1% dilutions should be made daily from a stock solution.

n) Decontamination of spills

The following procedure is recommended for decontaminating microbial spills.



- Isolate the area to prevent anyone from entering.
- Wear gloves and protective clothing (e.g. Lab coat, shoes and mask (if the spill contain a respiratory agent or if the agent is unknown).
- Absorb or cover the spill with disposable towel.
- Saturate the towels with an appropriately diluted intermediate or high-level disinfectant (e.g., a phenolic formulation or household bleach).

- Place disinfectant-soaked towels over the area and leave them in place for at least 15 minutes before removing and discarding them.
- Wipe area using clean disinfectant-soaked towels and allow area to air dry.
- Place all disposable materials used to decontaminate the spill into a biohazard container.
- Handle the material in the same manner as other infectious waste.

o) Accidents

Accidental inoculation with any microbe should be treated as a serious situation, regardless of whether the organism is considered as pathogenic or not. All injuries or unusual incidents should be reported immediately to the laboratory manager. When cuts or puncture wounds from potentially infected needles or glassware occur, the affected area should be promptly washed with disinfectant soap and water for 15 minutes. Seek immediate medical attention after that. In the event of a centrifuge accident in which safety carriers have not been used, other personnel in the area should be warned immediately and the area isolated to prevent anyone from entering.

Protective clothing and equipment

a) Laboratory coats

Protective coats, gowns, smocks, or uniforms designated for laboratory use must be worn while working in the laboratory. The laboratory coats should be fitted properly and should cover arms to the



wrist. This protective clothing should be removed and left in the laboratory before leaving for non-laboratory areas. All protective clothing is either disposed of in the laboratory or laundered by the institution; it should never be taken home by personnel.

b) Gloves

Regardless of the type of infectious material, gloves should



be worn when performing potentially hazardous procedures (e.g., slide agglutination) in which there is a risk of splashing or skin contamination or when the laboratory worker has cuts or broken skin on his or her hands. Gloves should

always be worn when handling clinical specimens, body fluids, and tissues from humans and animals. These tissues should be assumed to be positive for hepatitis B virus, HIV, or other blood-borne pathogens. Gloves must be removed when contaminated by splashing or spills or when work with infectious materials is completed. Glove should not be worn outside the laboratory. Personnel should not use telephone or open doors with gloves that have been used in laboratory procedures. All used gloves should be disposed of by discarding them with other disposable materials and autoclaving. **Hands should be washed immediately after removing gloves.**

c) Eye protection (goggles or safety glasses)

It is strongly suggested to wear some form of eye protection when handling large volumes of microorganisms to protect against splashing during handling. Even a non-pathogen can set up infection when introduced in large numbers on the conjunctiva.

References

- Centers for disease Control and Prevention, National Institute of Health. Biosafety in microbiological and biomedical laboratories. Washington DC; U.S. Government Printing Office, 1999; stock no.017-040-00547-4.
- World Health Organisation, Laboratory Biosafety Manual 2nd edition (revised). Geneva; WHO 2003; ISBN 92 4 154450 3



Pencapaian Organisasi OSH Kimia Pulau Pinang.

Organisasi Keselamatan dan Kesihatan Pekerjaan (OSH) yang diterajui Pengarah Kimia Pulau Pinang telah mencapai banyak kemajuan sejak kebelakangan ini. Dengan komitmen penuh dan juga sokongan kuat dari semua peringkat kakitangan, program OSH kini menjadi keutamaan dalam rutin seharian mereka.

Perancangan dan pelaksanaan aktiviti-aktiviti keselamatan dan kesihatan pekerjaan di Kimia Pulau Pinang berlaku secara berterusan. Dalam setiap majlis perhimpunan bulan, satu slot khas diperuntukan khusus untuk taklimat OSH. Kakitangan berpeluang untuk mendapat maklumat dan dalam masa yang sama secara spontan boleh mengutarakan masalah serta idea-idea untuk menambah baik keadaan.

Seramai 26 kakitangan dalam **Pasukan Pertolongan Cemas** yang diketuai Cik Noorhazlina Binti Abu Bakar telah memperolehi sijil kelayakan memberi bantuan kecemasan yang dikeluarkan oleh **Persatuan Bulan Sabit Merah Malaysia**.

Pasukan mencegah tumpahan bahan kimia (*Chemical Spill Response Team*) seringkali mengadakan demonstrasi dalam majlis perhimpunan bulanan. Pasukan yang diwakili oleh 8 orang kakitangan ini diketuai oleh Encik Ahmad Najib Kamil bin Dasuki. Kimia Pulau Pinang amat bertuah kerana pihak **HAZMAT** telah sudi untuk mengadakan demonstrasi dan tunjuk ajar bagaimana untuk menangani kes-kes tumpahan bahan kimia berbahaya.

Program pengawasan kesihatan di Kimia Pulau Pinang berjalan dengan lancar. Semua kakitangan Seksyen Serologi dan Kriministik dan Seksyen Toksikologi telah selesai

menjalani pemeriksaan dan juga suntikan vaksin Hepatitis B. Kumpulan kedua merangkumi kakitangan Seksyen Mikrobiologi, Seksyen Alam Sekitar dan Seksyen Narkotik, telah juga mendapat suntikan dos pertama dan dos kedua hepatitis B pada bulan Mei dan Jun. Suntikan dos terakhir akan dilakukan pada bulan November 2005.

Semua kakitangan yang berumur 40 tahun dan ke atas digalakkan untuk menjalani proses pemeriksaan perubatan sepertimana yang di arahkan dalam Pekeliling Perkhidmatan 3, tahun 2003. Seramai 16 orang kakitangan telah dikenalpasti untuk menjalani pemeriksaan tersebut di Hospital Pulau Pinang.

Program Pengawasan Kesihatan (*Health Surveillance Programme*) sebagaimana yang dikendaki dalam Peraturan *USECHH*, 2000 juga sedang giat dilaksana. Pihak Kementerian Kesihatan Malaysia Negeri Pulau pinang, pada dasarnya telah bersetuju untuk menyediakan seorang **Doktor Kesihatan Pekerjaan** (OHD) bagi memeriksa kakitangan yang telah dikenalpasti terdedah atau mungkin terdedah kepada bahan-bahan kimia berbahaya.

Pemasangan alat kelengkapan kejuruteraan, khususnya *fumehood* dalam bangunan baru akan turut mengambil kira keperluan perkara 17 dan 18 dalam Peraturan *USECHH*, 2000. Pihak kontraktor telah disyaratkan untuk menguji terlebih dahulu semua system LEV dengan mengikut spesifikasi Jabatan Keselamatan dan Kesihatan Pekerjaan.

Pasukan Menyelenggara dan Mencegah Kebakaran bukan sahaja ditugaskan untuk menyelia aktiviti kawad kebakaran setiap 6 bulan, tetapi mereka juga diarahkan memeriksa semua alat dalam sistem mengesan dan memadamkan kebakaran dalam bangunan.

Pihak pengurusan juga mengambil perhatian yang serius berikutan kejadian gempa bumi yang kerap berlaku pada awal tahun 2005. Satu **pelan tindakan kecemasan gempa bumi** telah di umumkan kepada seluruh warga Kimia Pulau pinang.

Hubungan baik di antara Kimia Pulau Pinang dan **NIOSH Kawasan Utara** telah menjadikan jabatan ini sebagai pilihan utama untuk menjalankan latihan amali kursus seperti CHRA, kursus Juruteknik Higen Industri 1 (Pemonitoran bahan kimia) dan Juruteknik Higen Industri 2 (Pemeriksaan alat LEV). Hubungan secara '*win-win situation*' ini membolehkan kedua belah pihak mendapat manfaat hasil perkongsian maklumat dan kepakaran masing-masing.

Dengan komitmen yang berterusan dari pihak pengurusan dan sokongan kuat seluruh warga Kimia Pulau Pinang, segala perancangan dan pelaksanaan yang sistematik, diharap mampu menjadikan jabatan ini sebagai model kepada agensi-agensi kerajaan yang lain dalam mewujudkan

Dengan komitmen yang berterusan dari pihak pengurusan dan sokongan kuat seluruh warga Kimia Pulau Pinang, segala perancangan dan pelaksanaan yang sistematik, diharap mampu menjadikan jabatan ini sebagai model kepada agensi-agensi kerajaan yang lain dalam mewujudkan tempat kerja yang selamat kepada semua pekerja dan pelawat yang sentiasa berurusan dengan jabatan ini.



Gambar 2: Kakitangan-kakitangan JKMPPP cuba melakukan CPR

-Disediakan oleh : Harun Ahmad
Setiasaha JKMP, Kimia Pulau Pinang

AKTIVITI BERGAMBAR OSH DI JKM PULAU PINANG



- Pemeriksaan stok sisa bahan kimia



- Pemeriksaan peralatan mencegah kebakaran



MAKLUMAT OSH DARI IBU

PELUPUSAN SISA KIMIA DI IBU PEJABAT



- Pembungkusan dan penghantaran sisa kimia ke Kualiti Alam telah dijalankan oleh syarikat Pamuri Holdings pada 18hb Jun 2005. Aktiviti pelupusan sisa bahan kimia ini akan diadakan setiap tahun.

LAWATAN DARI UTM KE IBU PEJABAT JKM



Lawatan UTM

Seramai 20 kakitangan dari UTM Skudai telah membuat lawatan ke makmal ibu pejabat di Petaling Jaya. Tujuan Lawatan sambil belajar adalah untuk mempelajari sistem pengurusan keselamatan di Ibu Pejabat. Satu taklimat diberikan oleh En. Chang Yit Fong diikuti dengan lawatan ke makmal GMO, stor sisa kimia, stor bahan kimia dan stor silinder gas.