Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com/sjams/

OPEN ACCESS

Biochemistry

Safety Checklists in Biomedical Laboratories

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DOI: 10.36347/sjams.2020.v08i10.030 | **Received:** 14.10.2020 | **Accepted:** 24.10.2020 | **Published:** 26.10.2020

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Abstract **Review Article**

The various laboratory safety guidelines are based on the revised federal 'Occupational Safety and Health Act (OSHA), USA and numerous safety standards suggested by the Joint Commission on Accreditation of Healthcare Organization (JCAHO), USA and the College of American Pathologists (CAP), USA. People working in clinical Laboratories are exposed to potential hazards. Risks can be minimized by taking various safety measures in the form of safety checklist. Establishing proper precaution in various areas of laboratories, one can maintain proper safety standards under differ heading.

Keywords: Occupational Safety and Health Act (OSHA), Joint Commission on Accreditation of Healthcare Organization (JCAHO), College of American Pathologists (CAP).

INTRODUCTION

People working in clinical laboratories are exposed to potential hazards. Risks can be minimized by eliminating dangerous situation when it's possible, Establishing clean and safe work habits, taking proper precaution at all times and maintaining awareness of good safety practices[1, 3].

The national fire protection association (NFPA) has developed a series of symbols to warn against fire, biological, clinical and radiation hazards. No clinical laboratories are completely safe unless laboratory workers themselves become aware of the potential hazard and their remedies and actively participate in an ongoing safety program. Each laboratory also should have a safety manual or safty checklist that lists all hazards and the precautions to take to minimize the dangers.

The main possible dangers in a clinical laboratory are – 1) fire, 2) infection, 3) contact to corrosive chemicals, 4) Exposure to toxic fumes, 5) Cuts and Punctures from broken glassware or other sharp objects, 6) Exposure to carcinogenic compound and 7) Possible Exposure to low – level Radioactivity.

The checklist is framed in order to assist in assessments of microbiological, clinical, biochemistry laboratory, safety and security status of biochemical laboratories.

Laboratory Premises

1. Do the premises meet the natural disaster precaution if necessary?
2. Are the premises generally uncluttered and free from obstruction?
3. Are the premises clean? Is there any check over housekeeping maintenance?
4. Are floors and stairs uniform and slip-resistant?
5. Is the working space adequate for safe operation?
6. Are the benches, furniture and fitting are in god condition?
7. Are bench surface resist to solvent and corrosive chemicals?
8. Is there a hand washing sink in each laboratory room?
9. Are the premises constructed and maintained to prevent entry and harbourage of rodents and arthropods?
10. Are all exposed steam and hot water pipes insulated or guarded to protect personnel?
11. Is an independent power support unit (generator/inventor) provided in case of power breakdown?
12. Can access to laboratory areas be restricted to authorized personnel?
13. Has a risk assessment been performed to ensure that appropriate equipment and facilities are available to support the work being considered?

Storage facilities

1. Are storage facilities, shelves etc arranged so that stores are secure against sliding, collapse or falls?
2. Are freezers and storage areas lockable?
3. Are storage facilities kept free from accumulation of rubbish, unwanted materials and objects that present hazards from tripping, fire, explosion and harbourage of pets?

Sanitation and staff facilities

1. Are the premises maintained in a clean, orderly and sanitary condition?
2. Is pure drinking water available?
3. Are clean and adequate toilet (WC) and washing facilities provided separately for male and female staff?
4. Are hot and cold water, soap and towels provided?
5. Are separate changing rooms provided for male and female staff?
6. Is there accommodation (e.g. lockers) for street clothing for staff members?
7. Is there a staff room, for lunch?
8. Are noise levels acceptable?

Heating and ventilation [2, 4]

1. Is there a comfortable working temperature?
2. Are blinds fitted to windows that are exposed to full sunlight?
3. Is the ventilation adequate, e.g. at least six changes of air per hour, especially in room that has mechanical ventilation?
4. Does mechanical ventilation compromise airflows in and around biological safety cabinets and fume cupboards?

Lighting

1. Is the general illumination adequate?(e.g.300-400 lx)
2. Is task (local) lighting provided at work benches?
3. Are all areas well-lit, with no dark or ill-lit corners in room and corridors?
4. Are fluorescent light parallel to the benches?
5. Are fluorescent lights colour-balanced?
6. Are the Electrical installations should conform to the National Electrical code NFPA 70 - 1971; ANSI CI-1971.

Services

1. Is each laboratory room provided with enough sinks, water, and electricity and gas outlets for safe working?
2. Is there an adequate inspection and maintenance programmer for fuses, lights, cables, pipes etc?
3. Are faults corrected within reasonale time?
4. Are internal engineers and maintenances services available, with skilled engineers and craftsman who also have some knowledge of the nature of the work of the laboratory?
5. Is the access of engineering and maintenance personnel to various laboratory areas controlled and documented?
6. Are cleaning services available?

Laboratory biosecurity

1. Are doors and windows break-proof?
2. Are rooms containing hazardous material and expensive equipment locked when unoccupied?
3. Are there using the proper respirators?
4. Is there using the proper eye and face protection?
5. Is there using the medical and first aid protection?

Fire prevention and fire protection

1. Is there fire detection equipment, smoke alarm, sprinkler system?
2. Are the fire doors, stairs, ramps, passageways, fire escaped etc in good order?
3. Is the fire detection system in good system in good working order and regularly tested?
4. Are fire alarm stations accessible?
5. Are all exit marked by proper, readily visible illuminated signs and Non exits clearly marked?
6. Are corridors, aisles and circulation areas clear and unobstructed for movement of staff and fire- fighting equipment?
7. Are all fire-fighting equipment and apparatus easily identified by an appropriate colour code?
8. Are portable fire extinguishers maintained fully charged and in working order and kept in designated places at all times?
9. Are laboratory rooms with potential fire hazards equipped with appropriate extinguishers and/or fir blanket for emergency use?
10. If flammable liquids and gases are used in any room, is the mechanical ventilation sufficient to remove vapours before they reach a hazardous concentration?
11. Are personnel trained to respond to fire emergencies?

Flammable liquid storage

1. Is it clearly labeled as a fire- risk area?
2. Are the switches for lighting sealed or placed outside the building?
3. Are flammable liquids stored in proper, ventilated containers that are made of non-combustible materials?
4. Are the contents of all containers correctly described on the labels?

5. Are appropriate fire extinguisher and/or fire blankets placed outside but near to the flammable liquid store?
6. Are "No Smoking" signs clearly displayed inside and outside the flammable liquid store?
7. Are they stored in properly constructed flammable storage cabinets?
8. Are these cabinets adequately labeled with "Flammable liquid-Fire hazard sign?
9. Are personnel trained to properly use and transport flammable liquids?

Compressed and liquefied gases

1. In each portable gas container legibly marked with its contents and correctly colour-coded?
2. Is a pressure-relief device connected when a cylinder is in use?
3. Are all compressed gas cylinder secured so that they cannot fall, especially in the event of nature disaster?
4. Are cylinder and liquid petroleum gas tanks kept away from source of heat?
5. Are personnel trained to properly use and transport compressed and liquefied gases?

Electrical hazards [2, 6]

1. Are all new electrical installations and all replacement, modifications or repairs made maintained in accordance with a national electrical safety code?
2. Does the interior wiring have an earthed/grounded conductor?
3. Are circuit-breakers and earth-fault interrupters fitted to all laboratory circuits?
4. Do all electrical appliances have testing laboratory approval?
5. Is each electric socket outlet used for only one appliance (no adapters to be used)?

Personal protection

1. Is protective clothing of approved design and fabric provided for all staff for normal work, e.g. gown, coveralls, gloves?
2. Is additional protective clothing provided for work with hazardous chemicals and radioactive and carcinogenic substances, e.g. rubber aprons and gloves for chemicals and for dealing with spillages?
3. Are safety glasses, goggles and shields (visors) provided?
4. Are there eye-wash stations?
5. Are there emergency showers?

Health and Safety of staff

1. Is there an occupational health service?
2. Is first-aid boxes provide at strategic locations?
3. Are qualified first aiders available?
4. Are non-laboratory workers instructed on the potential hazards of the laboratory and the material it handles?
5. Is there an immunization programme relevant to the work of the laboratory?
6. Are skin test and/or radiological facilities available for staff who work with tuberculous materials requiring such measures?
7. Are proper records maintained of illnesses and accidents?
8. Are personnel trained to follow appropriate biosafety practices?
9. Are laboratory staffs encouraged to report potential exposures?

Laboratory equipment [1, 6]

1. Is all equipment certified safe for use?
2. Are procedures available for decontaminating equipment prior to maintenance?
3. Are centrifuge buckets and rotors regularly inspected?
4. Are pipettes used instead of hypodermic needles?
5. Are there safe receptacles for broken glass?
6. Are plastics used instead of glass where feasible?
7. Are the sharps disposal containers available and being used?

Infectious materials

1. Are the specimens received in a safe condition?
2. Are record kept of incoming materials?
3. Are gloves and other protective clothing worn for unpacking specimens?
4. Are work benches kept clean and tidy?
5. Are discarded infectious materials removed daily or more often and disposed of safely?
6. Are appropriate disinfectants bring used? Are they used correctly?

Chemical and radioactive substances [3, 5]

1. Are incompatible chemicals effective separated when stored or handled?
2. Are all chemicals correctly labeled with names and warnings?
3. Are chemical hazard warning charts prominently displayed?
4. Are spill kits provided?
5. Are staffs trained to deal with spills?
6. Are bottle carriers provided?
7. Is a radiation protection officer or appropriate reference manual available for consultation?
8. Are staffs appropriately trained to safely work with radioactive materials?
9. Are radioactivity screens provided?
10. Are personal radiation exposures monitored?

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