

**GENERATION AND DISPOSAL OF WASTE IN MEDICAL
LABORATORY**

A SEMINAR PRESENTED

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TO THE

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JCS MEDICAL DIAGNOSTIC LABORATORIES AND

HEALTHCARE

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SUMMARY

Wastes are substances, materials discharged to, deposited in, or emitted to an environment in such amount or manner that causes a harmful change. They are categorized into Biological wastes: wastes that contain living matter/organism. Chemical wastes: wastes that contain chemical components. Radioactive wastes: wastes that contain radioactive rays/elements/ionizing radiations. Mixed wastes: wastes that contain a mixture of biological, chemical and radioactive waste. Sharp wastes: wastes that contain broken, pointed materials. Wastes generated are classified according to: Segregation: various types of wastes are segregated from each other. Fluid wastes are contained separately from solid waste. Biological wastes are not disposed with other radioactive waste. Packaging/labeling: different types of bags/containers available for disposal of various wastes. They contain biohazard symbol and the word bio-hazard in color contrasting bag/container. Treatment: Wastes are contaminated prior to disposal to destroy or remove microbial/ chemical/ radioactive load to a lower level such that it will not be infectious. Wastes are decontaminated through autoclaving, chemical disinfection and in some cases incineration. Storage: Liquid wastes are stored in a leak-proof container avoiding spillage. Solids are stored in a leak proof container with bag of moderate thickness. Sharps are stored in a puncture proof bag. Handling and transportation: wastes are treated before transportation. External surface of waste are free from contaminants and bags/containers are taped/tightly closed during transportation. Disposal: Liquids are disposed either through the laboratory sink, sanitary sewage system or in a leak proof container. Solids are disposed by autoclaving, deep bury and in some cases direct incineration. Sharps are disposed through an electric needle destroyer.

GENERATION AND WASTE DISPOSAL IN MEDICAL LABORATORY

Wastes are substances, materials discharged to, deposited in, or emitted to an environment in such amount or manner that causes a harmful change.

The characterization, management, storage and disposal of laboratory waste (chemical waste including hazardous and non hazardous solid waste, radioactive or mixed waste and sharp waste) is regulated and requires strict compliance with regulatory obligations.

Environmental Protection Agency has the overall responsibility for managing the process of

- Characterizing laboratory waste
- Containerizing laboratory waste
- Marking/labeling laboratory waste
- Managing laboratory waste in the laboratory spaces prior to waste disposal confirmation by Environmental health and safety (EHS) management. The environmental Affairs section of the EHS department is responsible for managing the review and characterization of laboratory waste, making the waste determination and responsible for approval of laboratory waste disposal request from the Environmental Protection Agency

The management steps for waste generation before disposal are:

- Segregation
- Collection
- Packaging and labeling
- Storage with color coded bags
- Handling and transport
- Treatment to disinfect
- Disposal

The above steps are taken in waste generation so as not to impose health hazard on staff, visitors, handles, animals, environment and community at large.

Wastes generated in the laboratory are of various categories such as:

- Biological waste
- Chemical waste
- Radioactive waste
- Mixed waste
- Sharp waste

BIOLOGICAL WASTE

Biological wastes are that waste that contains living matter/organism in them both hazardous and non hazardous. Biological waste includes:

- Liquids such as used cell culturing media, supernatant, blood or blood fractions (serum) which contain viable biological agents.
- Materials considered pathological, including any part of the human body, tissues and bodily fluids but excluding fluids extracted from teeth, hair, and nail clippings that are not infectious.
- Any part of an animal infected (or suspected to be infected) with a communicable -disease.
- Non sharp, solid laboratory waste (empty plastic cell culture flask and Petri-dishes, empty plastic tubes, gloves, wrappers, absorbent tissues) which maybe or is known to be contaminated with variable agents.
- All sharp and pointed items used in medical care, diagnosis and research, including the manipulation and care of laboratory animals which are considered to be potentially infectious.
- Laboratory glassware which is suspected to be contaminated with hazardous biological agents.

Segregation/Packaging

Materials contaminated with hazardous biological agents are collected in the appropriate containers and sterilized or disinfected before disposal.

In addition

Liquids containing bio-hazardous agents

Liquids are collected in leak proof container such as flasks/bottles.

Solids containing bio-hazardous agents

Non sharp, solid laboratory waste (empty plastic cell culture flasks and Petri-dishes, agar plates, empty plastic tubes, gloves, wrappers, absorbent tissues e.t.c) which maybe or is known to be infected with variable biological agents are collected in a Bio waste plastic 20 liter pail. These plastic pails display the bio-hazard warning symbol.





Biohazard Waste Pail



Biohazard Bag



Sterilization and disinfection

For safety reasons biological agents are inactivated by employing either chemical disinfection or steam sterilization procedures.

Autoclaving (steam sterilization): is the most preferred and reliable method of sterilizing biological waste.

Labelling

All filled bio waste plastic 20 litre pails contains the information (hospital number, bio safety certificate number). It is accurately recorded on the lid or in the case of a bag, on its side.

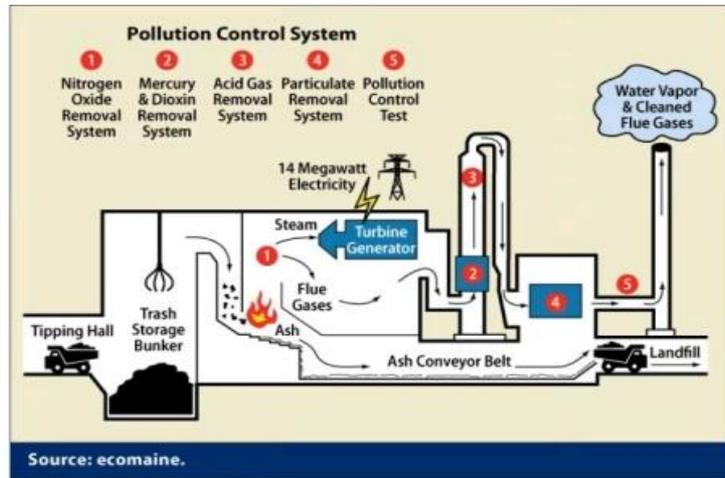
Storage/disposal

Following steam sterilization or chemical disinfection, innocuous liquids are disposed through the laboratory drainage system. Flush with sufficient clean water to purge the drainage immediately after disposal of liquids.

Melted agars are not poured into sink or floor drains. Allow to cool and solidify for disposal as a bio-waste. Solid biohazard wastes are either autoclaved, incinerated using an incinerator or deep buried.



INCINERATOR



Waste to Energy Incineration Process Diagram



AUTOCLAVE

Collection

Environmental Protection services collect waste directly from the labs therefore pails are not kept in hallways or corridors. They are kept in laboratory until picked up.

CHEMICAL WASTE

Chemical waste includes solids, liquids or gases containing or contaminated with chemical elements or substances. it include any of the following:

- Flammable solvents (e.g. acetone, alcohols,)
- Leachate toxic materials (e.g. heavy metals, pesticides)
- Corrosives (e.g. hydrochloric acid, potassium hydroxide)
- Reactive such as oxidizers, explosives and water reactive materials (e.g. sodium metals)
- Toxic materials including carcinogenic acute or chronic toxicity materials (e.g. chloroform, ethidium bromide)

Segregation/Packaging

- Incompatible materials are not mixed together in a single container
- Wastes are stored in containers compatible with the chemical stored.
E.g. hydrofluoric acid wastes are not stored in glass containers, corrosive chemicals are not in metal containers.
- Precipitates, solids or other non-fluid waste are not inserted into safety cans.

Labelling

Chemical waste labels are attached directly to the waste container. Chemical names of the chemical are listed. No abbreviations are to be used.

Storage

Chemical wastes are stored in the central waste holding facility of the laboratory building.

Aging containers are disposed promptly because some chemicals are time sensitive and may degrade into very hazardous by-products. E.g. ethers may degrade to form explosive organic peroxide.

Wastes are stored according to compatibility groups such as acids, bases, flammable, oxidizers and water reactive. Examples include:

Acid reactive compounds e.g. cyanides, sulphides which liberate gaseous substance when acidified are not mixed with any inorganic acid (e.g. sulphuric or hydrochloric acid).

Organic acids (e.g. glacial acetic acid) are segregated from inorganic acids (sulphuric or hydrochloric acid)

Water reactive materials (e.g. sodium) are kept away from any water source.



Chemical Waste Pail



Collection

Hazardous chemical waste collection is arranged through the Environmental Protection Agency. If the laboratory has a central waste holding facility the individual managing the area is responsible for scheduling collection. Hazardous waste is not allowed to accumulate.

RADIOACTIVE WASTE

Radioactive waste includes:

- Materials that have come into direct contact with radioactive materials (e.g. gloves, culture dishes, pipettes and flasks).
- Materials used for radioactive decontamination (e.g. paper, towels sponges).
- Materials that have come into incidental contact with radioactive material (e.g. bench top covering materials).
- Contaminated equipment used during radioisotope handling e.g. centrifuge.

Segregation\ packaging

Radioactive waste are not to be placed in non radioactive waste container, likewise non contaminated items should not be placed in radioactive waste containers. Radioactive wastes are segregated. Solid wastes are separated from liquid radioactive waste.

Solid Waste

Solid non sharp wastes for disposal are placed in the designated radioactive waste containers.

Sharp waste (glass wares, needles and blades) are not to be placed in solid waste containers.



**Radioactive Solid
Waste Container**



Liquid Waste

Radioactive liquid waste segregated according to half of lives of the isotope. Liquids containing radioactive material are to be poured into plastic bottles containing absorbent materials. The outside of the material must be clean and free of wet or dried liquids and of any hazardous biological or chemical agents.

Liquids containing radioactive material are not disposed through the laboratory sanitary sewage system.

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**Radioactive Liquid
Waste Container**

Labelling

Information (permit number, date, isotope and radioactivity) are accurately recorded in the accompanying tag as waste is added to the radioactive container.

Storage

Radioactive materials are not stored beneath any working area, whether or not it is used to work or not. Radioactive wastes are not stored in the vicinity of personnel who do not work with radioactive material. Radioactive animal carcasses are completely and securely wrapped and kept in a designated freezer. Radioactive material containing a hazardous chemical or biological agent is inactivated prior to disposal. Liquids are stored in a leak proof container.

Collection

Waste is removed from laboratories by the Environmental Protection Agency.

MIXED WASTE

Mixed wastes are waste containing combination of hazardous chemical, radioactive, biological agents. The biological hazards are inactivated first by disinfection. After disinfection, the remaining waste is disposed as either chemical waste or radioactive waste.

Regular garbage waste are deposited in a black base black lid container.



Regular garbage waste container

SHARP WASTE

The term Sharp is often used as an expression for any of all sharp or pointed items such as broken glassware, scalpel, razor blades, and lancets, syringes with needles which can cause a cut or puncture injuries.

Sharp waste is segregated into

Needle and blade waste

Glassware and plastic ware (other sharp or pointed) waste.

Needle and blade waste includes

Surgical suture or needles, syringes with needles, lancets scalpels blades and pointed items for disposal that are capable of causing punctures, cuts or tears in skin or membranes.

Packaging

All needle and blade waste for disposal are collected in an approved puncture proof needle and blade waste container. Needles are recapped, purposely bent removed from disposal syringes.

Labelling

The container for the collection of needle and blade waste is supplied with an affixed standard label.

Storage/disposal

Sterilization, disinfection or decontamination of needle and blade waste is required prior to disposal. The needled are treated using electric needle destroyer.



Sharps Container

GLASSWARE AND PLASTIC WARE WASTE

It includes: intact or broken laboratory containers such as flask, beakers, and bottles. Small glass containers, tubes, plastic pipette and micro pipette.

Packaging

Broken glassware, intact small glassware containers and tubes and pointed objects are placed in appropriate colored totter.

Labelling

Contaminated glassware's are labeled with the particular waste on the containers.

Storage/disposal

Colored totters are not overfilled rather 2 minimum headspace below the brim is left to allow installation of the brim.



REFERENCE

International Committee of the red cross (2011): medical waste management

Lunn, George and Eric Sansone (2012):”destruction of hazardous chemicals in the laboratory”. *3rd edition 162*: 453-458.

National research committee on prudent practices in the laboratory (2011) : “prudent practice in the laboratory, handling and management of chemicals in the laboratory”. Washington.

Washington State Department of Ecology (2014): “Treatment by Generation fact sheet” Publication number 97-431, WA: *of Ecology Publication*.

Washington State Department of Ecology (2009): “Dangerous Waste Regulations “chapter 173-303. *Department of Ecology Publication*.

Waddell., Dave. (2015):” Laboratory Waste Management Guide, Seattle” WA: *Local Hazardous Waste Management program in king country*.

World Health Organization (2018): Health-care Waste

University of Toronto (2016): Environmental health and safety 416.978.4467