

BIO-MEDICAL WASTE MANAGEMENT



BY-
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WASTES

WASTES

“Something which is not put into proper usage at a given time”.



BIO-MEDICAL WASTE: -

Any **waste** which is generated during the **diagnosis, treatment or immunization** of human beings or animals or in research activities **pertaining thereto** or in the production or testing of biological.



CAUSES

Improper:-

- ✓ Packaging
- ✓ Segregation
- ✓ Treatment and disposal

of biomedical waste.



CLASSIFICATION OF BIOMEDICAL WASTE:

**INFECTIOUS
WASTE.**

**PATHOLOGICAL
WASTE.**

SHARPS.

**PHARMACEUTIC
AL WASTE.**

**GENOTOXIC
WASTE.**

**CHEMICAL
WASTE.**

**WASTES WITH
HIGH CONTENT OF
HEAVY METALS.**

**PRESSURIZED
CONTAINERS**

**RADIOACTIVE
WASTE**

CLASSIFICATION OF BIOMEDICAL WASTE:

1. INFECTIOUS WASTE:

Infectious waste suspected to contain pathogens (bacteria, viruses, parasites, or fungi) in sufficient quantity to cause diseases in susceptible hosts.



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This category includes:-

- Cultures and stocks of infectious agents from laboratory work.
- Waste from surgery on patients with infectious disease.
- Infected animals from laboratories.



Classification continue...

2. PATHOLOGICAL WASTE:

It consists of tissues, organs, body parts, human fetuses, and animal carcasses, blood, and body fluids.



3. SHARPS:

These are the items that could cause cuts or puncture wounds, including;

- ✓ Needles,
- ✓ Scalpel and other blades,
- ✓ Knives,
- ✓ Infusion sets,
- ✓ Saws,
- ✓ Broken glass, and nails.



Classification continue...

4. PHARMACEUTICAL

WASTE:

It includes expired, unused, spilt, and contaminated

- ✓ Pharmaceutical products,
- ✓ Drugs,
- ✓ Vaccines, and sera



5. GENOTOXIC WASTE:

- Genotoxic waste is highly hazardous and may have;

- ✓ Mutagenic,

- ✓ Teratogenic, or

- ✓ Carcinogenic properties.



continue...

- It raises serious safety problems, both inside hospitals and after disposal, and should be given special attention.
- It includes certain **cytostatic drugs, vomit, urine, or feces** from patients treated with cytostatic drugs, chemicals, and radioactive material.



Classification continue...

6. CHEMICAL WASTE:

It consists of discarded

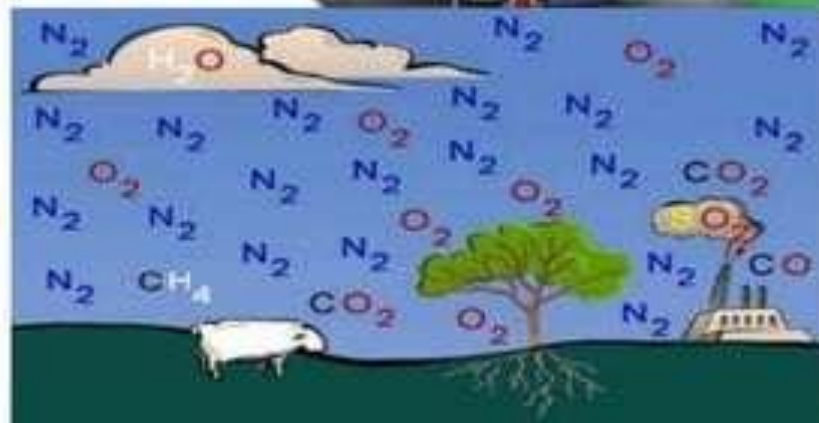
✓ Solid,



✓ Liquid, and



✓ Gaseous chemicals



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Chemical waste may be **hazardous or nonhazardous**.

It is considered to be hazardous if it has at least one of the following properties:

- ✓ Toxic,
- ✓ Corrosive (acids of $\text{pH} < 2$ and bases of $\text{pH} > 12$)
- ✓ Flammable,
- ✓ Reactive
- ✓ Genotoxic



Classification continue...

7. WASTES WITH HIGH CONTENT OF HEAVY METALS:

It represents a subcategory of hazardous chemical waste, and is usually **highly toxic**.

It includes

- ✓ Batteries,
- ✓ Broken thermometer,
- ✓ Blood-pressure gauges.



BROKEN MERCURY THERMOMETERS



Classification continue...

8. PRESSURIZED CONTAINERS:

Many types of gas are used in health care, and are often stored in **pressurized cylinders, cartridges, and aerosol cans.**

Most common gases used in health care includes:

- ✓ **Anesthetic gases**
- ✓ **Ethylene oxide**
- ✓ **Oxygen**
- ✓ **Compressed air**



Classification continue...

9. RADIOACTIVE WASTE:

It includes the X - rays, α - and β - particles, and γ - rays emitted by radioactive substances.

- α -particles, are heavy positively charged, and include protons and neutrons.
- They have low penetration power, and are hazardous to humans mostly when inhaled or ingested.



continue...

- **β - Particles**, are negatively or positively charged electrons with significant ability to penetrate human skin, they affect health through ionization of intracellular proteins and proteinaceous components.
- **γ - Rays**, are electromagnetic radiations similar to X-rays but to shorter wavelength. Their penetrating power is high and lead shielding is required to reduce their intensity.



SOURCES OF BIO-MEDICAL WASTE



**HOSPITALS,
HEALTH CARE
CENTERS**



BLOOD BANKS



**BIO TECHNOLOGICAL
INSTITUTION**

Ketnik

KOMATSU

Household Waste

Kate Waller

Sources continue...

3. BLOOD BANKS AND CLINICAL LABORATORIES:

Blood banks and laboratories generate most of the categories of biomedical waste.



4. HEALTH CARE ESTABLISHMENTS:

The sources of bio-medical waste generated in health care setting.



EFFECTS OF BIOMEDICAL WASTE: -

The improper management of biomedical waste causes serious environmental problems in terms of

- ✓ Air,
- ✓ Water and
- ✓ Land pollution.



1. AIR POLLUTION:

- Air pollution can be caused in both *indoors* and *outdoors*.
- Biomedical waste that generates air pollution is of three types-
 - Biological,
 - Chemical and
 - Radioactive.



Air pollution continue...

A. Indoor air pollution:-

Hospital Acquired Infections (Nosocomial infection).

Indoor air pollution can
caused due to:

- Poor ventilation
- The paints, carpet, furniture, equipment's, etc., used in the rooms.
- Use of chemicals, disinfectants, fumigants etc.







3. LAND POLLUTION:

- Open dumping of biomedical waste is the greatest cause for land pollution.
- Soil pollution from bio-medical waste is caused due to infectious waste, **discarded medicines, chemicals.**
- Heavy metals such as **cadmium, lead, mercury,** etc., which are present in the waste will get absorbed by plants and can then enter the food chain.



Methods of disposal of bio-medical waste and their segregation

WASTE CATEGORY	TYPE OF WASTE	TREATMENT AND DISPOSAL OPTION
Category No. 1	Human Anatomical Waste (Human tissues, organs, body parts)	Incineration@ / deep burial*
Category No. 2	Animal Waste (Animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals and colleges, discharge from hospitals,)	Incineration@ / deep burial*
Category No. 3	Microbiology & Biotechnology Waste (Wastes from laboratory cultures, stocks or specimen of live microorganisms, human and animal cell cultures used in research and infectious agents from research and industrial laboratories, wastes from production of biological, toxins and devices used for transfer of cultures)	Local autoclaving/ microwaving / incineration@

<p>Category No. 4</p>	<p>Waste Sharps (Needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps)</p>	<p>Disinfecting (chemical treatment@@ / autoclaving / microwaving and mutilation / shredding</p>
<p>Category No. 5</p>	<p>Discarded Medicine and Cytotoxic drugs (Wastes comprising of outdated, contaminated and discarded medicines)</p>	<p>Incineration@ / destruction and drugs disposal in secured landfills</p>
<p>Category No. 6</p>	<p>Soiled Waste (Items contaminated with body fluids including cotton, dressings, soiled plaster casts, lines, bedding and other materials contaminated with blood.)</p>	<p>Incineration@ / autoclaving / microwaving</p>
<p>Category No. 7</p>	<p>Solid Waste (Waste generated from disposable items other than the waste sharps such as tubing, catheters, intravenous sets, etc.)</p>	<p>Disinfecting by chemical treatment@@ / autoclaving / microwaving and mutilation / shredding# #</p>

Category No. 8	Liquid Waste (Waste generated from the laboratory and washing, cleaning, housekeeping and disinfecting activities)	Disinfecting by chemical treatment@@ and discharge into drains
Category No. 9	Incineration Ash (Ash from incineration of any biomedical waste)	Disposal in municipal landfill
Category No.10	Chemical Waste (Chemicals used in production of biological, chemicals used in disinfecting, as insecticides, etc.)	Chemical treatment @@ and discharge into drains for liquids and secured landfill for solids.

STEPS IN THE MANAGEMENT OF BIOMEDICAL WASTE:-



COLOR CODING FOR SEGREGATION OF BIOMEDICAL WASTE: -

COLOR	WASTE	TREATMENT
Yellow	Human & Animal anatomical waste / Micro-biology waste and soiled cotton/dressings/linen/beddings etc.	Incineration / Deep burial
Red	Tubing's, Catheters, IV sets.	Autoclaving / Microwaving / Chemical treatment
Blue / White	Waste sharps (Needles, Syringes, Scalpels, blades etc.)	Autoclaving / Microwaving / Chemical treatment & Destruction / Shredding
Black	Discarded medicines/cytotoxic drugs, Incineration ash, Chemical waste.	Disposal in secured landfill



RESEARCH ARTICLE

A cross-sectional study was conducted among hospitals (bed capacity >100) of Allahabad city on **“Knowledge, Attitude, and Practices about Biomedical Waste Management among Healthcare Personnel”**

Medical personnel included were

- ✓ Doctors (75),
- ✓ Nurses (60),
- ✓ Laboratory technicians (78), and
- ✓ Sanitary staff (70).

RESULTS:

- Doctors, nurses, and laboratory technicians have better knowledge than sanitary staff regarding biomedical waste management.
- Knowledge regarding the color coding and waste segregation at source was found to be better among nurses and laboratory staff as compared to doctors.
- Regarding practices related to biomedical waste management, sanitary staff were ignorant on all the counts.

**THANK YOU
EVERYONE**