

Biomedical Waste Management



Biomedical Waste

Definition:

Wastes that are generated during the laboratory diagnosis, treatment or immunization of human beings or animals, or in research activities pertaining thereto, or in the production of biologicals.

Slide 2

a1

acer, 02-Nov-20

Waste Generated in Hospitals

General waste (80%)

Pathological and infectious waste (15%)

Chemical and pharmaceutical waste (3%)

Sharp waste (1%)

Less than 1% accounts for special waste such as cytotoxic drug, radioactive waste, broken thermometers and used batteries.



Situation in India

According to the Ministry of Environment and Forests gross generation of biomedical waste in India is about 4,05,702 kg/day

Of which only 2,91,983 kg/day is properly disposed


28% of the wastes is left untreated and not disposed, finding its way in dumps or water bodies and re-enters our system.

Karnataka tops the chart among all the states in generation of biomedical waste.






Biomedical waste Management Rule, India 2016

	Type of waste	Type of Bag/ container	Treatment/ Disposal options
Yellow infectious non- plastic waste 	Human anatomical waste	Yellow coloured non chlorinated plastic bags	Incineration/ Plasma pyrolysis/ deep burial
	Animal anatomical waste		
	Soiled waste		Incineration/ Plasma Pyrolysis/ deep burial/ autoclaving or hydroclaving + shredding/mutilation
	Expired/ discarded medicines- pharmaceutical waste, cytotoxic drugs	Yellow coloured containers/ non chlorinated plastic bags	Incineration (cytotoxic drugs at temperature > 1200 ⁰ C)
	Chemical waste	Yellow coloured containers/ non chlorinated plastic bags	Incineration or Plasma pyrolysis or Encapsulation




Biomedical waste Management Rule, India 2016


Category	Type of waste	Type of Bag/ container	Treatment/ Disposal options
Yellow infectious non-plastic waste 	Chemical liquid waste	Separate collection system leading to effluent treatment system	Pre-treated before mixing with other wastewater
	Discarded linen contaminated with blood/body fluids	Non-chlorinated yellow plastic bags/ suitable packing material	Non-chlorinated chemical disinfection followed by incineration/ plasma pyrolysis
	Microbiology, other clinical lab waste, blood bags, live/attenuated vaccines	Autoclave safe plastic bag/ container	Pre-treat to sterilize with non-chlorinated chemicals on-site as per NACO/ WHO guidelines + Incineration.



Biomedical waste Management Rule, India 2016


Category	Type of waste	Type of Bag/ container	Treatment/ Disposal options
Red 	Infectious plastic waste (Recyclable)	Red coloured non-chlorinated plastic bags or containers	<ul style="list-style-type: none">• Autoclaving/ micro-waving/ hydroclaving + shredding• Mutilation/ sterilization+ shredding. Treated waste sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making,

Biomedical waste Management Rule, India 2016

Category	Type of waste	Type of Bag/ container	Treatment/ Disposal options
White (Translucent) 	Waste sharps including metal sharp	Puncture proof, Leak proof, tamper proof containers	<ul style="list-style-type: none"> • Autoclaving/ dry heat sterilization+ shredding/ mutilation • Encapsulation in metal container or cement concrete • Sanitary landfill/ designated concrete waste sharp pit



Biomedical waste Management Rule, India 2016

Category	Type of waste	Type of Bag/ container	Treatment/ Disposal options
Blue 	Glassware Metallic body implants	Cardboard boxes with blue colored marking	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium Hypochlorite treatment)/ through autoclaving/ microwaving/ hydroclaving + recycling



TREATMENT AND DISPOSAL METHODS

Incineration

Method of choice of disposal of biomedical waste.—————

High temperature dry oxidation process that reduces organic and combustible waste into nonorganic incombustible matter, resulting in a very significant reduction of waste volume and weight



Incineration

Incineration done for:

- Those wastes that cannot be reused, recycled or disposed off in a landfill site, for example, human and animal anatomical waste, microbiological waste, solid non-plastic infectious waste

Incineration should not be done for:

- Pressurized gas containers
- Reactive chemical waste
- Halogenated plastics such as PVC (polyvinyl chloride)
- Waste with heavy metals such as mercury, silver salts, radiographic waste, broken thermometers.



Autoclave

For ease and safety in operation, the system should be horizontal type and exclusively designed for the treatment of biomedical waste.

For optimum results, pre-vacuum-based system is preferred against the gravity type system.

Tamper-proof control panel with efficient display and recording devices for critical parameters such as time, temperature, pressure, date and batch number, etc.



Chemical Disinfection

Chemicals such as sodium hypochlorite (1–2%) are added to waste to kill or inactivate the pathogens within it.



Effluent Treatment Plant

Liquid effluent generated during the process of washing containers, vehicles, floors, etc. is first subjected to chemical treatment and then disposed in effluent treatment plant.



Microwaving

In microwaving, microbial inactivation occurs as a result of the thermal effect of electromagnetic radiation.

Intermolecular heating process

Heating occurs inside the waste material in the presence of steam

Efficacy should be monitored regularly.



Shredder

Waste are reshaped or cut into smaller pieces so as to make the wastes unrecognizable.

Helps in prevention of reuse of biomedical waste

Acts as identifier that the waste has been disinfected and is safe to dispose off.



Sanitary Landfill

Small deep burial pit of 2 meters depth.

Should be half filled with waste, then covered with lime within 50 cm of the surface, before filling the rest of the pit with soil.

Designed for disposal of hospital waste.



Encapsulation

Involves filling containers with waste, adding immobilizing material and sealing the containers

To prevent the access to unscrupulous activities.



Inertization

Involves mixing waste with cement and other substances before disposal

To minimize the risk of toxic substances contained in the waste migrating into surface or ground water.



Plasma Pyrolysis

Makes use of an ionized gas in the plasma state to convert electrical energy to temperatures of several thousand degrees using plasma arc torches or electrodes.



Differences between Biomedical Waste Rule 1998 and 2016

	BMW Rule 1998	BMW Rule 2016
Categories	Ten	Four
Overlapping of category	Yes	No
Incinerator	May have only one chamber	Upgrade to have secondary chamber
Chlorinated Bags	Using it	Phase out in two years
Cytotoxic drugs	Black colour bag	Yellow bag
Majority of idea	Discarding the BMWs	For recycling