

UNIT 5

Biomedical Waste Management

- Introduction

- Waste produced in the health care sector can prove highly hazardous, more so in the pandemic era. If not treated, these biomedical wastes can contribute to the rapid spread of coronavirus and other infections.
- In June 2015, the Working Group of the Ministry of Environment, Forest & Climate Change released the draft of [New Bio-Medical Waste Management Rules 2016](#). These rules are followed in the country for the segregation of biomedical waste.

What is Biomedical Waste?

Biomedical waste is any waste containing infectious or potentially infectious materials. These wastes are generated during the diagnosis, treatment, and immunization of humans and animals.

Biomedical wastes can be in both solid and liquid forms. Examples of biomedical wastes include:

- Waste sharps such as needles, lancets, syringes, scalpels, and broken glass
- Human tissues or identifiable body parts (as a result of amputation)
- Animal tissues and waste from veterinary hospitals
- Used bandage, dressings, gloves, and other medical supplies
- Liquid waste from infected areas
- Laboratory wastes

Biomedical wastes are distinct from regular garbage and require particular disposal and treatment.

Types of Biomedical Waste

The World Health Organization (WHO) has categorized biomedical waste into eight categories. They are:

- Infectious Waste – Any biomedical waste that is infectious or contaminated.
- Sharps – Sharps objects like needles, scalpels, broken glass, and razors.
- Pathological Waste – Body parts of humans or animals, including tissues, fluids, or blood.
- Pharmaceutical Waste – Unused drugs, medicine, or creams that are expiring.
- Genotoxic Waste – Toxic drugs and hazardous toxic waste
- Radioactive Waste – Any waste containing potentially radioactive materials
- Chemical Waste – Liquid waste from machines, batteries, and disinfectants is chemical.
- General/Other Waste – All other non-hazardous waste.

Further, the Central Pollution Control Board (CPCB) has designated separate colour-coded bins to dispose of biomedical wastes as per their nature.

- Yellow Bin: For anatomical waste, chemical waste, soiled waste, chemotherapy waste, discarded linen and medicines, and laboratory waste.
- Red Bin: For contaminated plastic wastes
- Blue Bin: For glass waste and metallic implants
- Black Bin: For hazardous and other waste

The wastes in each of the bins have different treatment and disposal methods.

Effects of Biomedical Waste

Exposure to hazardous biomedical waste can cause disease or injury to human health. HIV, hepatitis B, and C are the three most commonly spread viruses worldwide due to improper treatment of medical wastes. They are transmitted through injuries from contaminated syringes and needles.

Doctors, nurses, and sanitation workers are amongst the most vulnerable to the harmful effects of biomedical waste.

At a time of rapid emergence of new strains of the novel coronavirus, the importance of appropriate treatment of medical wastes cannot be more emphasized. The various technologies that can be used for treatment include:

- Incineration
- Chemical Disinfection
- Wet Thermal Treatment
- Microwave Irradiation
- Land Disposal

BIOMEDICAL WASTE MANAGEMENT PROCESS

It is essential to be properly collect, segregate, store, transport, treat and dispose off in safe manner to prevent hospital acquired infection.

- Waste collection
- Segregation
- Transportation and storage
- Treatment & Disposal
- Transport to final disposal site
- Final disposal
- Pharmaceuticals
- Pressurized containers

Biomedical Waste Treatment and Disposal

Health care waste is a heterogeneous mixture, which is very difficult to manage as such. But the problem can be simplified and its dimension reduced considerably if a proper management system is planned.

Incineration Technology

This is a high temperature thermal process employing combustion of the waste under controlled condition for converting them into inert material and gases. Incinerators can be oil fired or electrically powered or a combination thereof. Broadly, three types of incinerators are used for hospital waste: multiple hearth type, rotary kiln and controlled air types. All the types can have primary and secondary combustion chambers to ensure optimal combustion. These are refractory lined.

- **Autoclaving**

- The autoclave operates on the principle of the standard pressure cooker.
- The process involves using steam at high temperatures.
- The steam generated at high temperature penetrates waste material and kills all the micro organism
- These are also of three types: Gravity type, Pre-vacuum type and Retort type.
- Autoclave treatment has been recommended for microbiology and biotechnology waste, waste sharps, soiled and solid wastes. This technology renders certain categories (mentioned in the rules) of bio-medical waste innocuous and unrecognizable so that the treated residue can be land filled.

- **Microwave Irradiation**

- The microwave is based on the principle of generation of high frequency waves.
- These waves cause the particles within the waste material to vibrate, generating heat.
- This heat generated from within kills all pathogens.

- **Chemical Methods**

- 1 % hypochlorite solution can be used for chemical disinfection.