

# Medical Pollutants

# Medical Waste

Any wastes that are generated from all types of health care institutions, including hospitals, clinics, doctor's (including dental and veterinary) offices and medical laboratories.

# Types of Medical Waste

1. Normal waste
2. Toxic and Dangerous waste
  - Pathological waste
  - Polluted waste
  - Radioactive waste
  - Chemical waste
  - Pharmaceutical waste
  - Instrument and Equipment waste

# Treatment of Medical Waste

- Treatment of medical waste depends on the type of waste
- There are numerous methods to treat Medical Waste including
  - 1. Landfill**
  - 2. Incineration**
  - 3. Thermal inactivation**
  - 4. Gas/Vapor Sterilization**
  - 5. Chemical disinfection**
  - 6. Sterilization By Irradiation**

# Landfill

- An engineered method of land disposal of solid or hazardous wastes in a manner that protects the environment and prevent leachate leakage into the soil or groundwater
- Landfills may be categorized according to their design: open dumps, basic landfills, sanitary landfills, and bioreactor landfills
- They can be classified based on the type of waste they accommodate, such as municipal, industrial, and hazardous wastes

# Landfill



Municipal solid-waste landfills receive millions of tons of waste each year, including medical waste. Heavy equipment places and compacts the waste on top of the landfill liner

# Incineration

- Complete combustion by exposure of the waste to intense heat ranging from 1,800°F to 2,000°F (982°C to 1093°C)
- It has been used for several years to treat and destroy medical wastes
- Pathological medical waste is waste that comes from a living organism, such as tissue, organs, body parts and blood, is usually incinerated
- On-site incineration provides the advantage of a quick, easy disposal method, but there are emissions concerns

# Thermal Inactivation

- Involves heating waste to temperatures at which infectious agents are killed
- The types of pathogens in the waste determine the temperature and duration of treatment
- This method is usually used for large volumes
- Liquid waste is collected in a vessel and heated by heat exchangers or a steam jacket surround the vessel
- Solid infectious waste is treated with dry heat in an oven, which is usually electric. This method requires higher temperatures and longer treatment cycles
- After treatment, the contents can be discharged into the sanitary sewer



# Gas/Vapor Sterilization

- Gas/vapor sterilization uses gaseous or vaporized chemicals as the sterilizing agents, the gas that comes into contact with the waste will kill harmful, infectious agents
- ***Ethylene oxide*** and ***formaldehyde*** are the most commonly used agents
- Because of the toxicity of ethylene oxide and its ability to adsorb on the surface of treated materials, ethylene oxide is not recommended for treating infectious wastes

# Chemical Disinfection

- This process involves the use of chemical agents for disinfection, such as chlorine. Chemical disinfection processes are most appropriate for liquid wastes, although they can still be used to treat solid wastes.

Consider the following:

- Type of microorganism
- Degree of contamination
- Type of disinfectant
- Contact time
- Other relevant factors such as temperature, pH, mixing requirements,
- Another option is the grinding of medical waste before exposing it to a liquid chemical disinfectant. Grinding ensures sufficient exposure of the chemical agent to all parts of the waste and assists in easy disposal of any residues. The resulting liquids are placed into the sewer system, while solid residues are disposed in landfills

# Sterilization By Irradiation

- This method involves sterilizing waste by exposing it to ionizing radiation. For example, cobalt gives out gamma radiations that destroy all microbes in waste
- It is not recommended for pathological wastes

## **Advantages of irradiation:**

- Steam is not required
- No heat or chemicals remain in the treated waste

## **Disadvantages of irradiation:**

- Costs are high
- Highly trained personnel are required
- Space requirements are great
- Worker exposure as a result of leaks in seals or poor work practices
- Disposal of the radiation source may pose problems