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Medical Microbiology

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Jyotica Ahluwalia



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Chapter 3

Hospital Waste Management

INTRODUCTION

Biomedical wastes are defined as waste that is generated during the diagnosis, treatment or immunization of human beings or animals, or in research activities.

Biodegradable waste means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard.

Nonbiodegradable wastes are the wastes that cannot be decomposed by bacteria, e.g. plastics, bottles and tins.

Biosafety is essential to prevent the type of hazard by all medical, nursing and paramedical workers as well as by patients, attendants, ancillary staff and administrators in a hospital.

Sterilization removes all microorganisms, including spores from an object. It can be done either by dry heat (for 2 hours at 170°C in an electric oven—method of choice for glass ware and sharps) or by various forms of moist heat (i.e. boiling in water for an effective contact time of 20 minutes or steam sterilization in an autoclave at 15 lb/sq inch at 121°C for 20 minutes).

Disinfection reduces the number of microorganisms on an object or surface but not the complete destruction of all microorganisms or spores.

The quantum of waste that is generated is estimated to be 1–2 kg per bed per day in a hospital and 600 g per day per bed in a general practitioner's clinic, out of which only 5–10 kg of it is hazardous

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waste. Immediate treatment and disposal are ideal procedures to be followed for disposal of biomedical waste. Untreated biomedical waste, however, can be stored for not more than 48 hours. If for some reason it becomes necessary to store the waste beyond such period, permission from the local state authority must be taken and it must be ensured that it does not adversely affect human health and the environment.

Microwave treatment should not be used for cytotoxic, hazardous or radioactive wastes, animal carcasses, body parts and metal items. The microwave should be able to kill all bacteria and microorganisms completely and consistently. The indicator organism is *Bacillus subtilis* spores using vials or spore strips with at least 1×10^4 spores per millimeter.

Materials that can be recycled are glass, paper, corrugated cardboard, aluminium, X-ray film, silver from X-ray films, plastic which are noninfectious.

The organic wastes are easier to handle because it will decompose over a period of time. It is this which through the process of composting produce rich manure, which is safe and better than chemical fertilizers. The use of earthworms in the process of composting is known as vermiculture and is proving to be very useful and successful.

HAZARDS ASSOCIATED WITH BIOMEDICAL WASTE

Improper disposal can result in the following:

1. Organic portion ferments and attracts fly breeding.
2. Injuries from sharps to health workers and waste handlers.
3. Poor infection control can lead to nosocomial infections in patients particularly HIV, hepatitis B and C.
4. Increase in risk associated with hazardous chemicals and drugs being handled by persons handling wastes.
5. Development of resistant strains of microorganisms.
6. Poor waste management encourages unscrupulous persons to recycle disposables and disposed drugs for repacking and reselling.

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PERSONS AT RISK

Person at risk include laboratory personnel, nurses, attenders, etc.

Procedure	*Person at risk*	*Mode of transmission*
Collection of blood samples	Patient health worker	Contaminated needle, gloves, skin puncture by needle or container, contamination of hands by blood
Transfer of specimens (within laboratory)	Laboratory personnel	Contamination of exterior of specimen container, broken container, splash of specimen
HIV serology and virology	Laboratory personnel	Skin puncture, splash of specimen, broken specimen container, perforated gloves
Cleaning and maintenance	• Laboratory personnel • Supporting staff	Skin puncture or contamination, splashes, contaminated work surface
Waste disposal	• Laboratory personnel • Support staff • Transport worker	Contact with contaminated waste, puncture wounds and cuts
Shipment of specimens	• Transport worker Postal worker	Broken or leaking specimen, containers and packages

TEN CATEGORIES OF HOSPITAL WASTE

Category	*Type of waste*	*Treatment and disposal options*
Category 1	Human anatomical waste (human tissues, organs, body parts)	Incineration/deep burial
Category 2	Animal waste (animal tissues, organs, body parts, carcasses, bleeding parts, blood and experimental animals used in research)	Incineration/deep burial
Category 3	Microbiology and biotechnology waste (waste from lab culture, specimens from microorganisms, vaccines, cell cultures, toxins, dishes, devices used to transfer cultures)	Local autoclaving/ microwaving/incineration
Category 4	Waste sharps (needles, syringes, scalpels, blades, glass)	Chemical disinfection/ autoclaving/microwaving, mutilation and shredding

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Category	*Type of waste*	*Treatment and disposal options*
Category 5	Discarded medicines and cytotoxic drugs (outdated, contaminated, discarded drugs)	Incineration/destruction and disposal in landfills
Category 6	Soiled waste (contaminated with blood and body fluids including cotton, dressings, soiled plasters, linen)	Autoclaving/microwaving/ incineration
Category 7	Solid waste (tubes, catheters, intravenous sets)	Chemical disinfecion/ autoclaving/microwaving, mutilation and shredding
Category 8	Liquid waste (waste generated from laboratory and washing, cleaning, disinfection)	Disinfection by chemical treatment and discharge into the drains
Category 9	Incineration ash	Landfills
Category 10	Chemical waste	Chemical disinfection and discharge into the drains

COLOR CODES AND TYPES OF CONTAINERS USED FOR DISPOSAL

Color coding	*Type of container*	*Waste category*	*Treatment options*
Yellow	Plastic bags	Human and animal wastes, microbial and biological wastes and soiled wastes (category 1,2,3 and 6)	Incineration/deep burial
Red	Disinfected container/ plastic bags	Microbiological and biological wastes, soiled wastes, solid wastes (category 3,6,7)	Autoclave/ microwave/chemical treatment)
Blue/white/ transparent	Plastic bag, puncture proof container	Waste sharps and solid waste (category 4 and 7)	Autoclave/ microwave/ chemical treatment destruction and shredding
Black	Plastic bag	Discarded medicines, cytotoxic drugs, incineration ash and chemical waste (category 5,9 and 10)	Disposal in secured landfills
Green	Plastic container	General waste such as office waste, food waste and garden waste	Disposed in secured landfills

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QUESTION BANK

1. Define sterilization and disinfection.
2. Give an account on hospital waste management.
3. What hazards are associated with biomedical waste?
4. How hospital waste is segregated in different categories?
5. What color containers are used for waste disposal?

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