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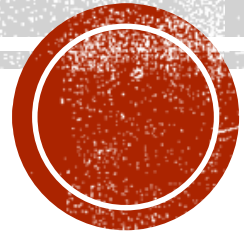
CL144A : ENVIRONMENTAL SCIENCES



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HOSPITAL WASTE MANAGEMENT

HOSPITAL
WASTE MANAGEMENT

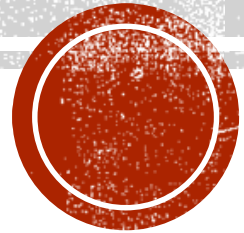
Bio-medical waste management

OBJECTIVES

Definition
Source of health care waste
Classification of waste (WHO)
Bio-medical waste in India during COVID-19
Problems associated with health care waste
Magnitude of problem in developing and developed countries
Generation/ Segregation/ Storage/ Transportation/ Treatment & Disposal of waste
Treatment technique & categorical treatment .

WHAT IS HOSPITAL WASTE ?

- Hospital waste are the waste produced in the course of health are activities during treating, diagnosing and immunizing human being or animals or while doing study/ research activities.
- 75-90% non-hazardous/ general waste
- 10-15% hazardous



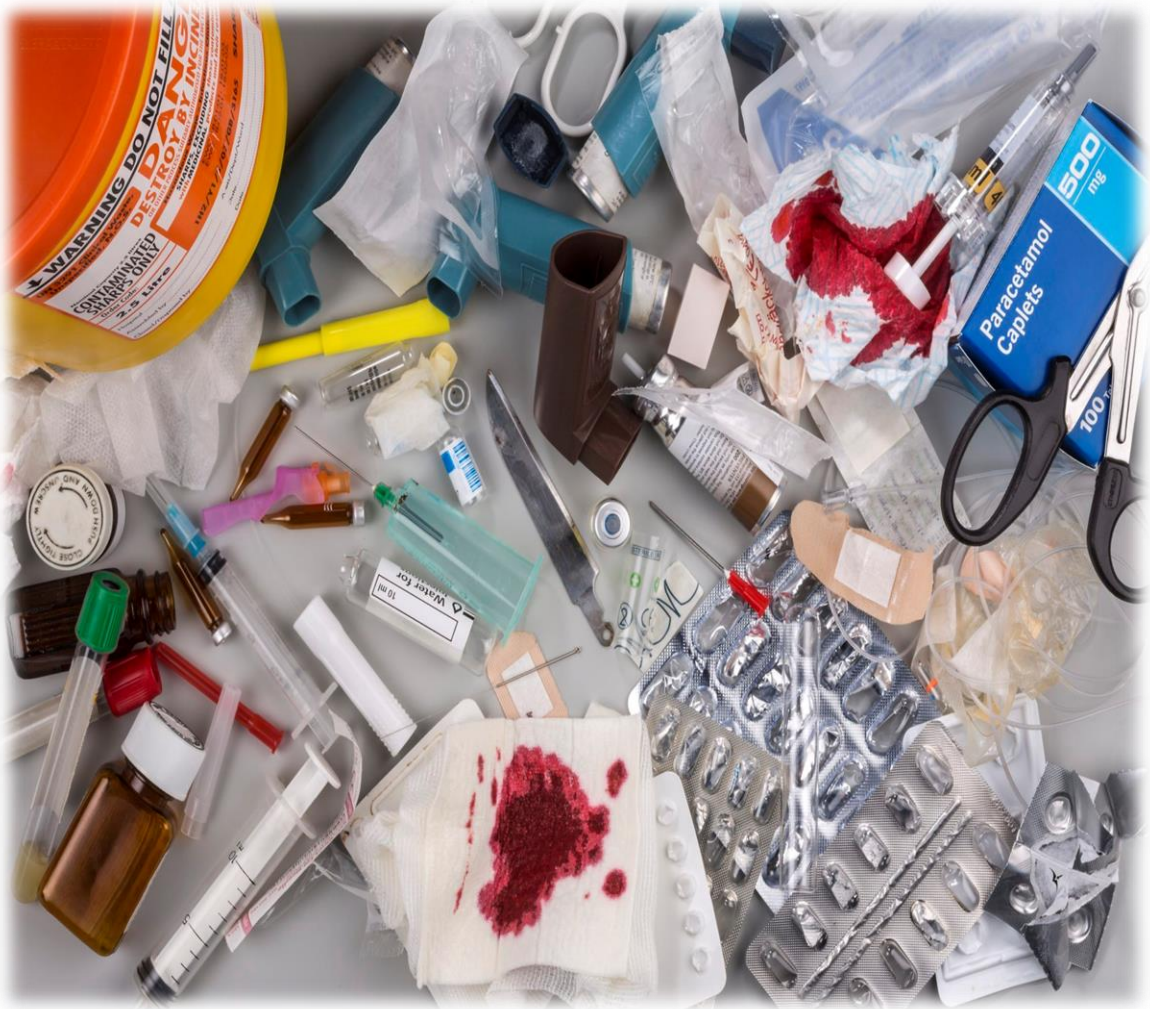
SOURCE OF HEALTH CARE WASTE

- Government hospital
- Private hospital
- Nursing homes
- Physician's office
- Dentist office
- Dispensaries
- Mortuaries
- Blood bank and collection center
- Animal house
- Laboratories
- Research organization

W.H.O. CLASSIFICATION

Waste categories	Description and examples
1. General waste	No risk to human health E.G.: Office paper, wrapper, kitchen, waste, general sweeping etc.
2. Pathological waste	Human tissue or fluid E.G.: Body parts, blood, body fluids etc.
3. Sharps	Sharp waste E.G.: Needle, scalpel, knives, blades etc.
4. Infectious waste	Which may transmit bacterial, viral or parasitic disease to human being, waste suspected to contain pathogen E.G.: Laboratory culture, tissue (swab) bandage etc.
5. Chemical waste	E.G.: Laboratory reagent, disinfectants, film developer
6. Radio-active waste	E.G.: Unused liquid from radiotherapy or lab research, contaminated glassware etc.

GENERAL WASTE CATEGORIES

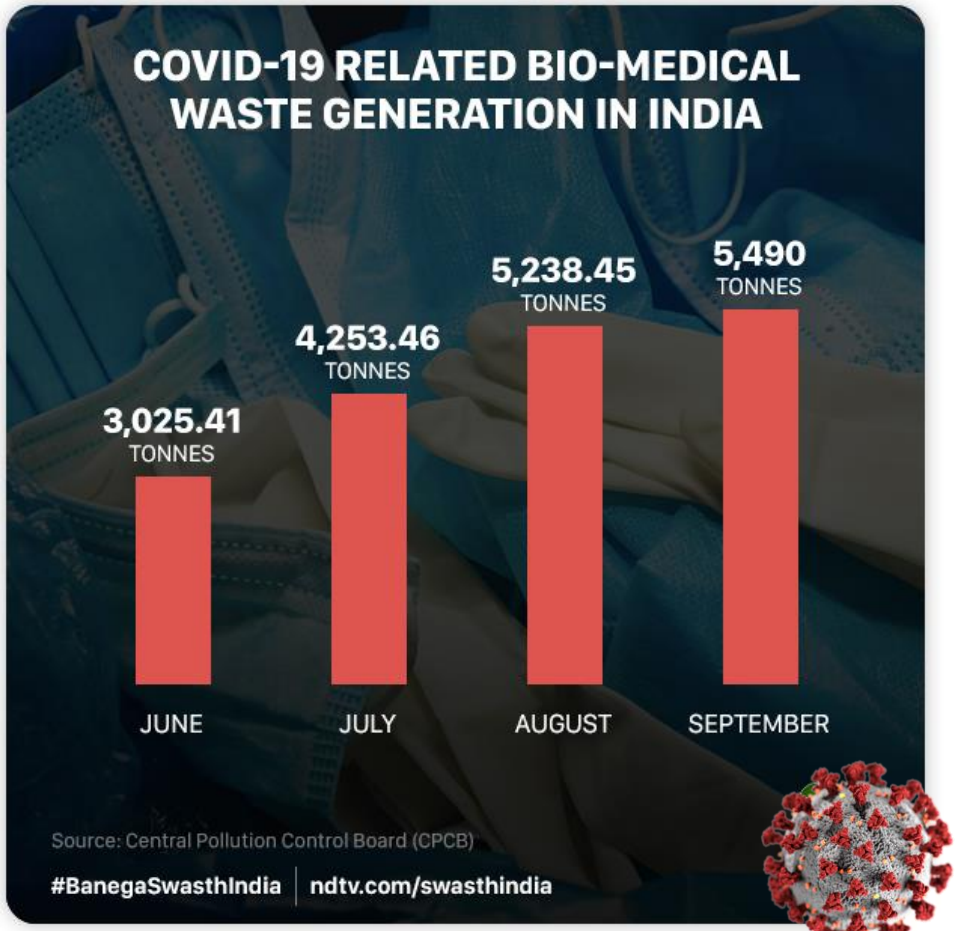


Waste categories	Description with examples
1. Pharmaceutical waste	Expired outdated drugs/ chemicals
2. Pressurized container	Gas cylinder, aerosol cans etc.
3. Genotoxic waste	Waste containing cytotoxic drugs (often used in cancer therapy)

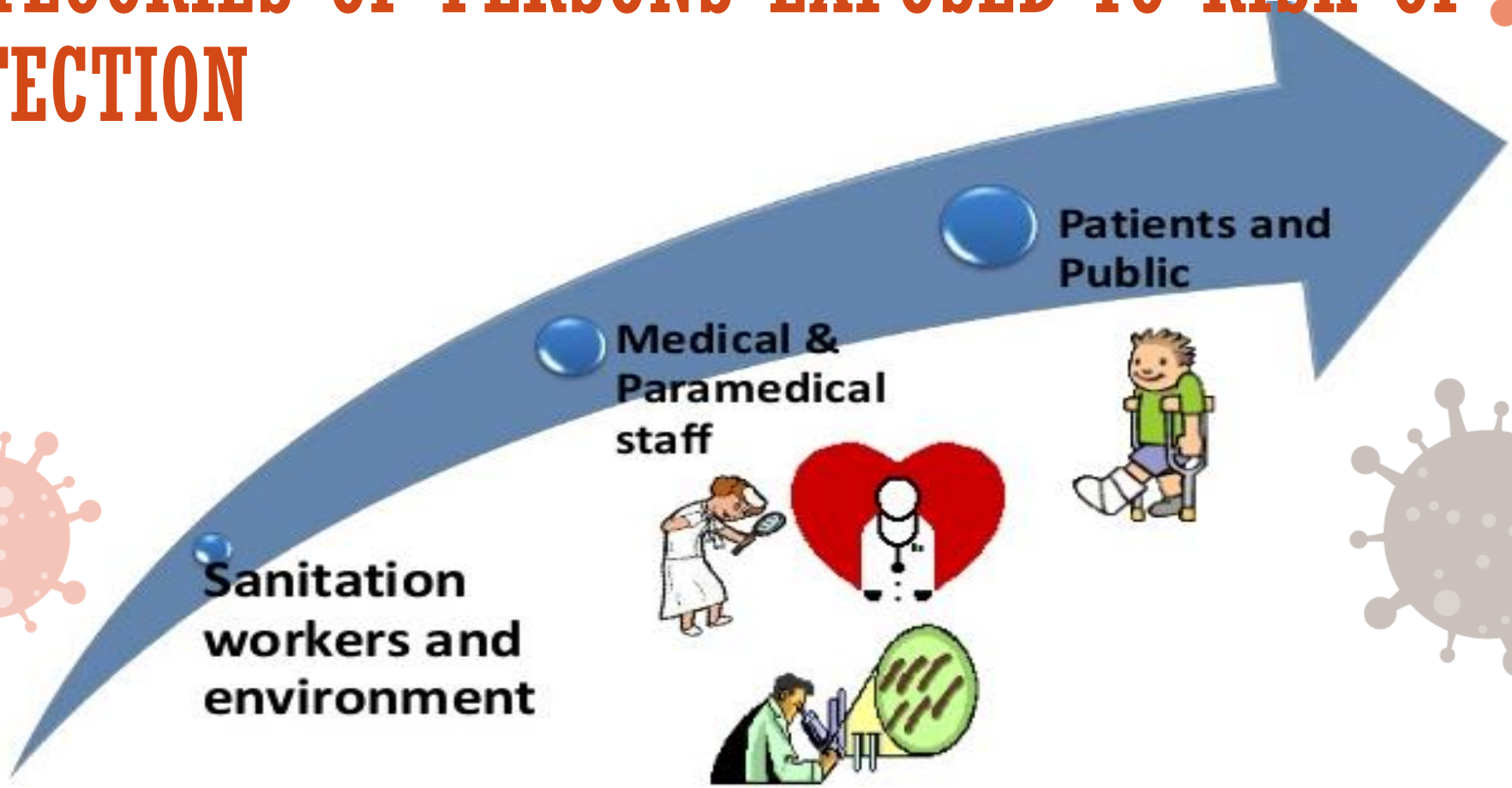
As propagated by CAD, Atlanta under US classification, pathological waste, and sharp waste also come under ' INFECTIOUS WASTE'

** Types and nature of hospital waste depends upon the service available in hospital and nature of hospital.

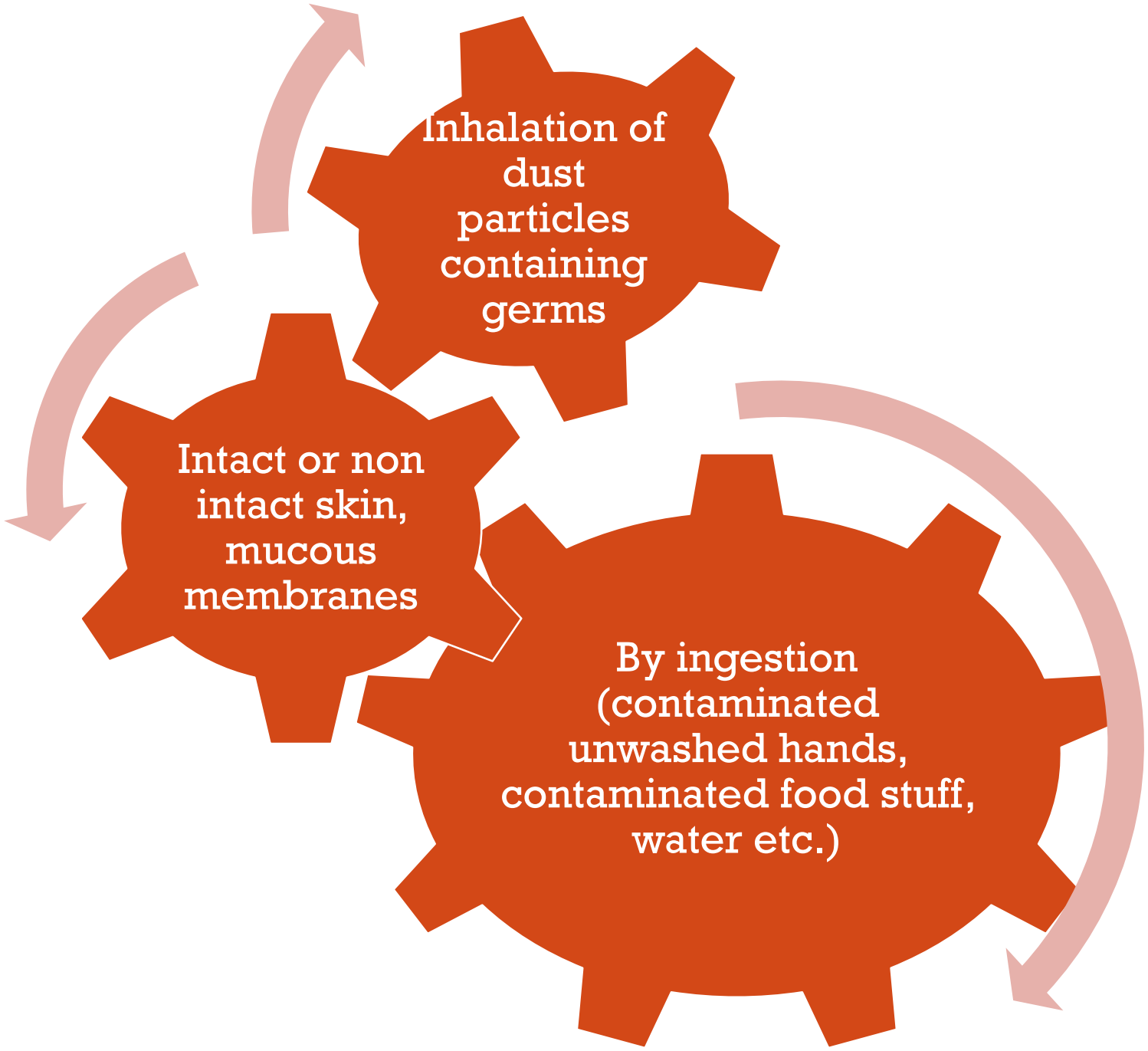
BIO MEDICAL WASTE IN INDIA DURING COVID-19



CATEGORIES OF PERSONS EXPOSED TO RISK OF INFECTION



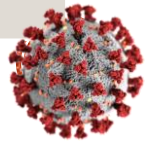
ROUTES OF TRANSMISSION




LET THE WASTE OF THE
“SICK” NOT
CONTAMINATE
THE LIVES OF
“THE HEALTHY”

PROBLEMS ASSOCIATED WITH BIOMEDICAL WASTE

Organism	Diseases caused	Related waste item
Viruses HIV, hepatitis B, hepatitis A, C, arboviruses , enteroviruses , herpes virus	AIDS, infection hepatitis, dengue, japanese encephalitis, ocular infection, genital infection	Infection needles, body fluids, human excreta, blood fluid, eye secretion, genital secretion
Bacteria Salmonella typhi, vibrio cholerae, clostridium tetani, pseudomonas, Streptococcus	Typhoid, cholera, tetanus wound infections, septicemia, rheumatic fever, endocarditis, skin and soft tissue infection	Human excreta and body fluid in landfills and hospital wards, sharps such needles, surgical blades in hospital
Parasites Wuchereria bancrofti , Plasmodium	Cutaneous leishmaniasis, Filariasis kala azar , malaria	Human excreta, blood and body fluid in poorly managed sewage system



MAGNITUDE OF THE PROBLEM

GLOBALLY- developed countries generate 1 to 5 kg/bed/day
developing countries: meager data, but figures are lower.
1-2 kg/pt./Day
WHO report: 85% non hazardous waste : 10% infective waste : 5% non-infectious but hazardous. (Chemical, pharmaceutical and radioactive)

GENERATION, SEGREGATION, COLLECTION, STORAGE, TRANSPORTATION AND TREATMENT OF WASTE

1. GENERATION

Type	Site of generation	Disposal by
Non- hazardous waste/ general waste	Office, kitchen, administration, hostels, stores, rooms etc.	Municipal/ public authority
Hazardous (infections & toxic waste)	Wards, treatment room, dressing room, OT, ICU, labour room, laboratory, dialysis room, CT scan, radio-imaging etc.	Hospital itself

2. SEGREGATION

Segregation of waste in color coded bags

YELLOW BAGS	RED BAGS	BLUE BAGS	BLACK CARBOY
Infectious waste,bandages,gauzes,cotton or any oter things in contact with body fluids, human body parts,placenta	Plastic waste such as catheters,injections, syringes, tubings i.v. bottels	All types of glass bottels and broken glass articles, outdated & discarded medicines	Needles without syringes, blades,sharps and all metal articals

Done at point of generation of waste and put in separation colored bags. Color coding varies from nation to nation.

For e.g. in AIIMS hospital, New Delhi, color code bags are practiced.

3. COLLECTION OF WASTE

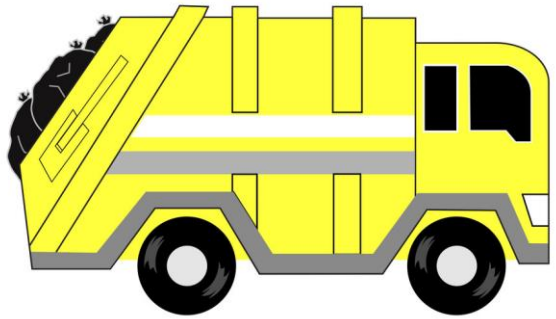
- Centralized sanitation staffs or any other sanitation staff should collect the waste during morning afternoon or evening under the supervision of nursing staff and sanitation supervisor; documentation should be done in register.
- Garbage bin should be cleaned and disinfected regularly.

4. STORAGE OF WASTE

- Waste should not be stored in the generation area for more than a period of 4-6 hours.
- It is responsibility of paramedic/sanitation staff to check for segregation.
- Waste collected in various areas should be transported for disposal/treatment.

5. TRANSPORTATION

- There should be separate corridor and lift in hospital to carry and transport waste. General waste are deposited at municipal dumps. Waste for autoclaving and incineration are dumped at separate site for external transport (should have separate colored plastic bag for these waste).
- Transportation should be done in sealed container/sanitation supervisor should ensure for leakage.



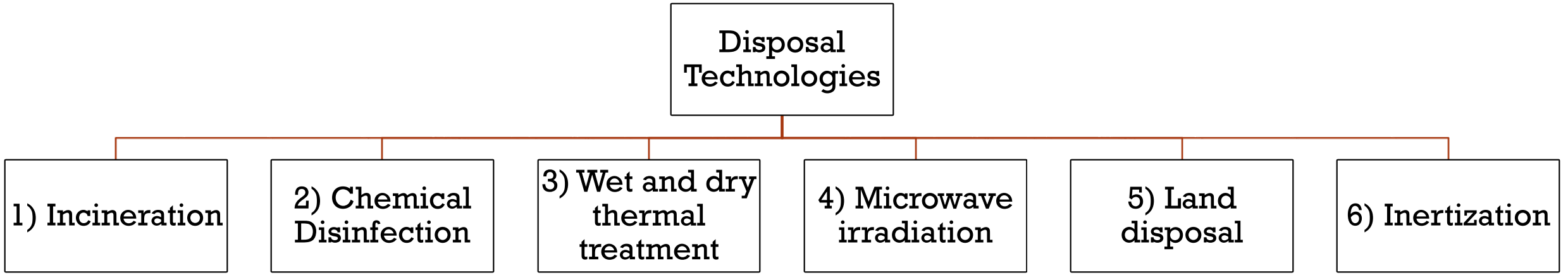
CONSIDERING THE ROUTE IS IMPORTANT !!!

6. TREATMENT AND DISPOSAL

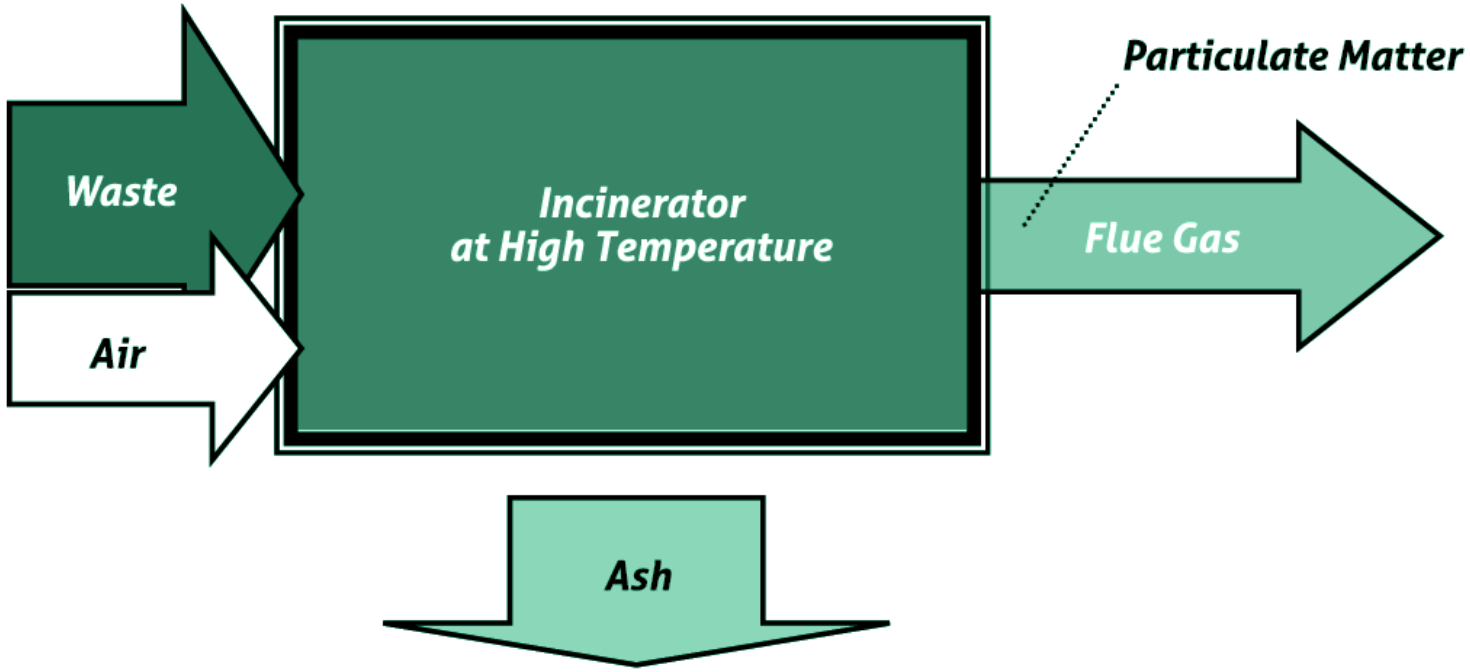
- General waste should be dumped at municipal dumping site.
- Sanitation officer should be responsible for proper coordination between municipal and hospital.
- Use of label/symbols is useful in identifying waste for treatment example: Risk of corrosion, Danger of Infection, Toxic hazards, Glass Hazards, Radioactive materials etc.

BIOHAZARD

DISPOSAL TECHNOLOGIES



1) INCINERATION



TYPES OF INCINERATORS:

I. Double chambered (for infectious waste)
II. Single chambered (if double chamber not affordable)
III. Rotatory Kilns (for genotoxic waste)

- High temperature dry oxidation process that reduce organic and combustible waste into inorganic incombustible matter. Resulting in significant reduction in waste volume and weight.
- Process is selected to treat waste that cannot be recycled, reused or can be disposed in land

2) CHEMICAL DISINFECTION

- Commonly Used for treatment of liquid infectious waste example: blood, urine, stool and hospital sewage.
- Chemicals are added to waste to kill or inactivate the pathogen it contains.

3) WET AND DRY THERMAL TREATMENT

Wet thermal treatment(steam disinfection):

- Shredded infectious waste-high temperature- high pressure steam
- This process is similar to autoclaving

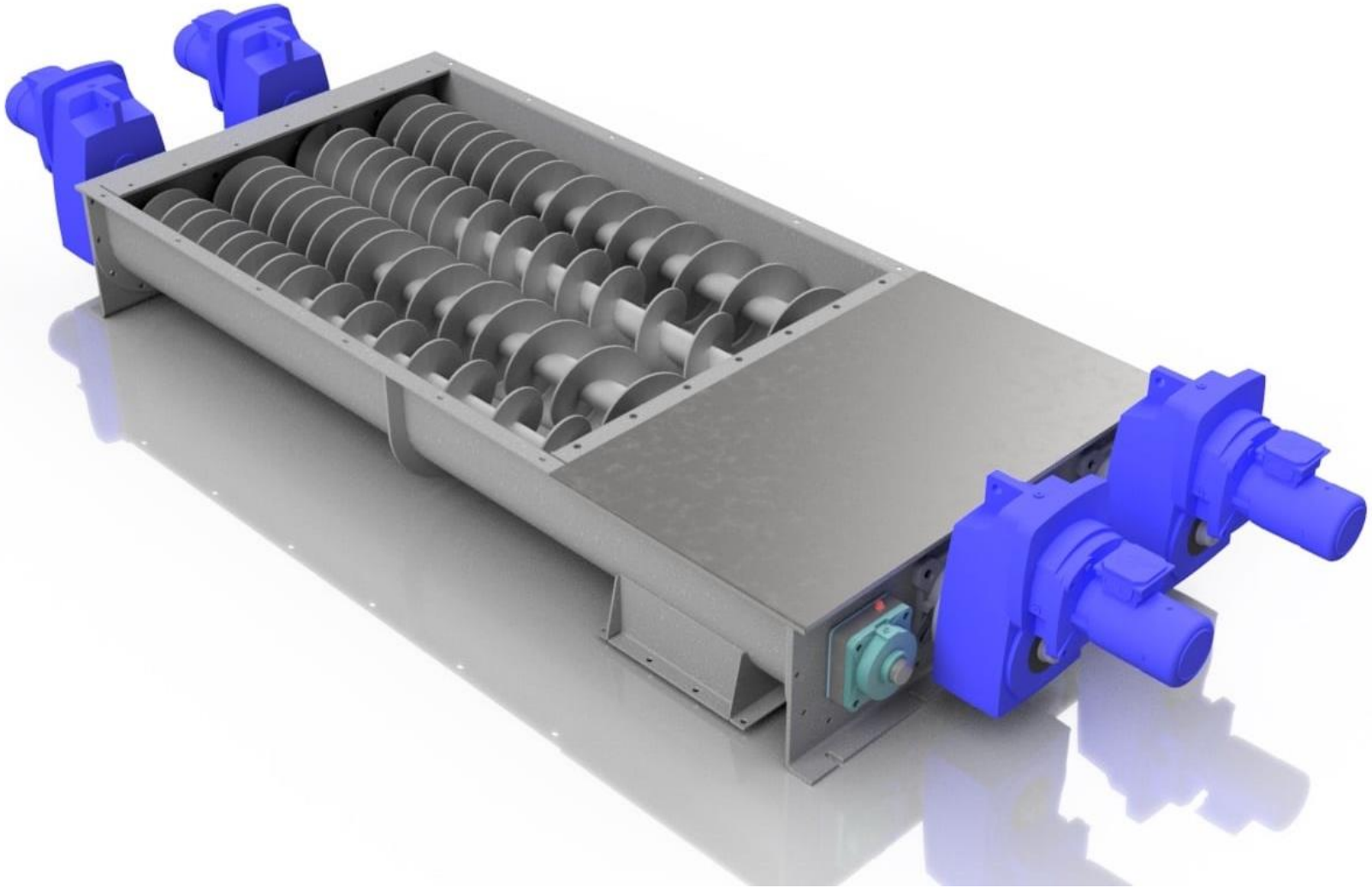
Off-site wet thermal (or "steam autoclave") treatment facility

Screw-feed technology:

- Dry thermal disinfection process
- Waste shredded- rotating auger-heated

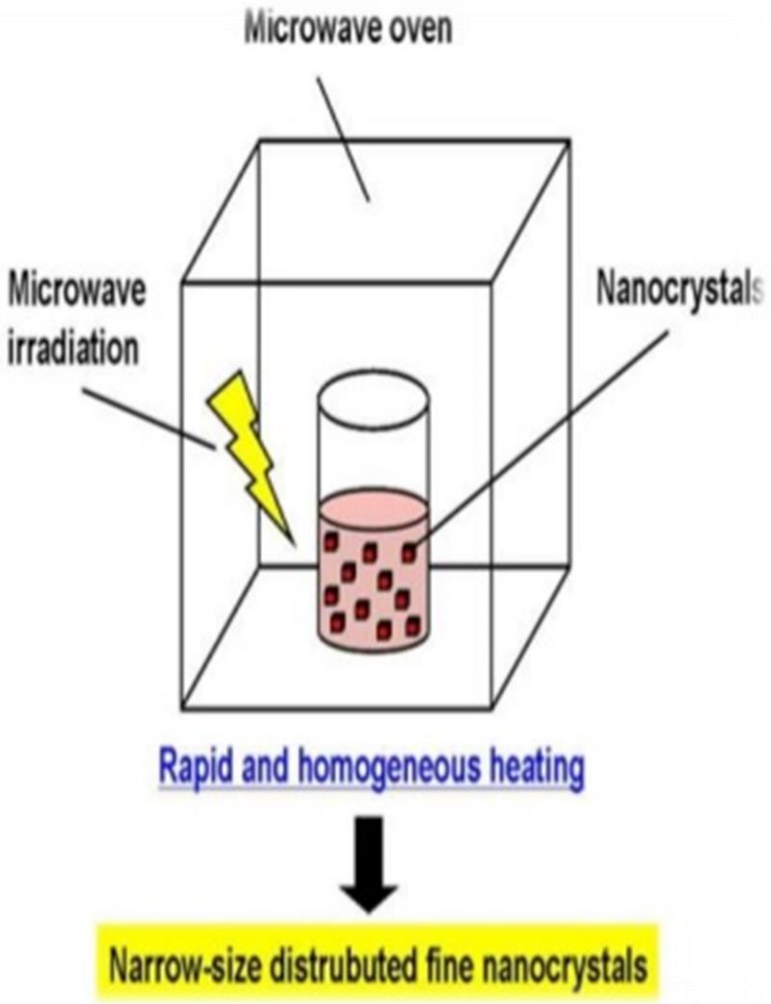
- Wet thermal treatment/steam disinfection is based on exposure if infectious waste to high temperature and high pressure steam similar to process of autoclaving, inappropriate for treating anatomical waste, chemical and pharmaceutical waste.

SCREW FEED TECHNOLOGY



- Dry thermal treatment in which waste is shredded and heated in rotating auger.
- 80% volume and 20-35 weight is reduced.
- This method is suitable for infectious waste and sharps.
- Not used to process pathological, cytotoxic or radioactive waste.

4) MICROWAVE IRRADIAION

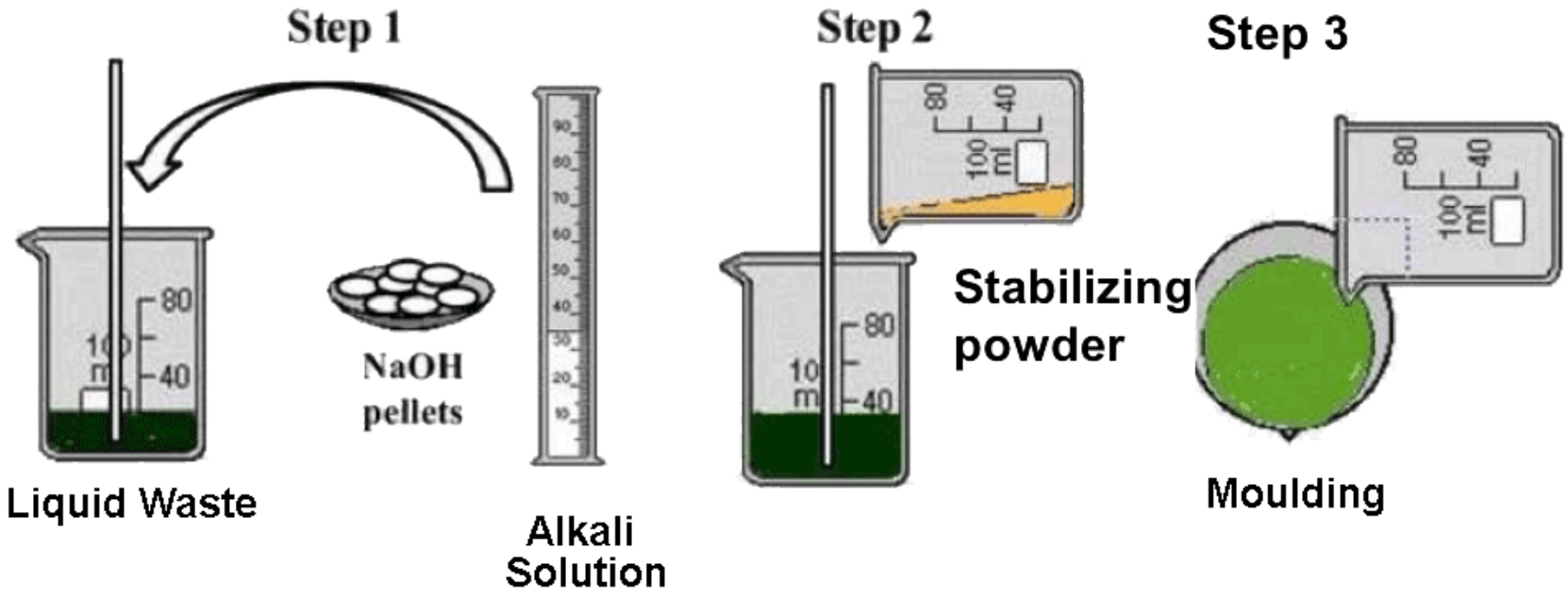


- Microwave of frequency 2450MHZ and wave length 12.24cm used to destroy the microorganism.
- Water contained in the waste is rapidly heated by microwave and infectious components are destroyed by heat conduction.

5) LAND DISPOSAL

- Open dumps: risk for public health
- Sanitary landfills: designed and constructed to prevent contamination of soil, surface, ground water and direct contact with public.

6) INERTIZATION



- Process of mixing waste with cement and other substances before disposal in order to minimize the risk of toxic substance migration into surface water or ground water and prevent scavenging.
- Proportion of water 65% waste 15% lime 15% cement and 5% water is used.

CATEGORIES OF BIOMEDICAL WASTE SCHEDULE

Waste Category	Type of waste	Treatment and disposal option
1)	Human Anatomical waste	Incineration Deep Burial
2)	Animal waste (Animal tissues, organs, body parts, carcasses, bleeding parts, fluid, waste generated by burial veterinary hospitals and colleges, discharge from hospitals and animal houses)	Incineration Deep Burial

Waste Category	Type of waste	Treatment and disposal option
3)	Microbiology & Biotechnology Waste (Wastes from laboratory cultures, stocks or specimen of live micro organisms or attenuated vaccines, animal cell cultures used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins and devices used for transfer of cultures)	Local autoclaving Microwaving Incineration
4)	Waste sharps (Needles, syringes, scalpels, blades, glass, etc. that may Cause puncture and cuts. It includes both used and unused sharps)	Disinfecting Chemical Treatment Autoclaving Microwaving

Waste Category	Type of waste	Treatment and disposal option
5)	Discarded medicine and cytotoxic drugs (Wastes comprising of outdated, contaminated and discarded medicines)	Incineration Destruction and drugs disposal in secured landfills
6)	Soiled waste (Items contaminated with body fluids including cotton, dressings, soiled plaster casts, lines, bedding and other materials contaminated with blood)	Incineration Autoclaving Microwaving
7)	Solid waste (Waste generated from disposable items other than the waste sharps such as tubing, catheters, intravenous sets, etc.)	Disinfecting chemical treatment Autoclaving Microwaving

Waste Category	Type of waste	Treatment and disposal option
8)	Liquid waste (Waste generated from the laboratory and washing, cleaning, house keeping and disinfecting activities)	Disinfecting chemical treatment Discharge into drains
9)	Incineration Ash (Ash generated by incineration process)	Disposal in municipal landfills
10)	Chemical waste (Chemicals used in production of biologicals, chemicals used in disinfecting and as insecticides)	Chemical treatment Discharge into drains for liquids Secured landfills for solid

Sources :

- World Health Organization : https://www.who.int/
- Central Pollution Control Board : https://cpcb.nic.in/covid-waste-management/
- Biomedical waste services : https://bwaste.com/resources/the-knowledge-center/articles-insights-and-updates/types-biomedical-waste-disposal
- Celitron : https://celitron.com/en/biomedical-waste-management-disposal-methods

THANK YOU !

HAVE A NICE DAY…