CHAPTER - 5

SEGREGATION OF WASTE

Definition

Waste segregation is the division of waste into dry and wet. Dry waste includes wood and related products, metals and glass. Wet waste typically refers to organic waste usually generated by eating establishments and are heavy in weight due to dampness.

As per the Biomedical Waste (Management and Handling) Rules 1998, Segregation is defined as “the separation of different types of wastes by sorting.”

Factors on which Segregation depends:

- Size and type of the hospital
- Training level of waste handlers
- Motivation of hospital staff for the effective implementation of Biomedical Waste Management Program.
- Utilisation and implementation of BMW management policy.
- Availability of SOPs for BMW Management

Colour Coding Criteria for the segregation of waste according to the category of waste

Category of Waste	Color Code for the Containers
General Waste (non hazardous)	Black
Sharps (both infected and non infected)	Yellow
Infected Waste other than Sharps	Yellow
Chemical Waste	Red
Clinical Waste that requires autoclaving	Blue

COLLECTION AND STORAGE OF WASTE

The waste may be temporarily stored at the central storage area of the hospital and from there it may be sent in bulk to the site of final disposal once or twice a day depending upon the quantum of waste. BMW should be kept only in a specified storage area.

After removal of the bag, clean the container including the lid with an appropriate disinfectant. Waste bags and containers should be removed daily from wards / OPDs or even more frequently if needed (as in Operation Theatres, ICUs, Labor rooms).Waste bags should be transported in a coveredBwheeled containers or large bins in covered trolleys.

Prerequisites for the Collection and Storage of waste are:

- Good sanitary and housekeeping service.
- Safe water supply.
- Effective sterilization of utility areas in operation theatre.

Characteristics of Waste Storage Containers

- It should be made up of hard plastic or metal.
- Its surface should be smooth.
- It should be leak proof and puncture proof.
- It should be of appropriate size so that it may contain a quantum of waste generated.
- The lid should be tight and should remain closed to avoid spillage.

- Interiors of the containers should be smooth so that it may not tear the plastic bags kept inside the containers for storage.
- The containers should be of appropriate colours for easy identification and effective implementation.

TRANSPORTATION OFWASTE

The transportation of waste is of **two types**

i.e. **intramural** and **extramural**.

Intramural

The intramural transportation is the transportation inside the hospital done with the help of push carts, trolleys and wheel barrow.

Extramural

The extramural transportation is the transportation of waste when it is carried outside the hospital for treatment and disposal. It is done with the help of rickshaw,van or lorry.

During transportation following points should be taken care of:

👉Ensure that waste bags/containers are properly sealed and labeled.
👉Bags should not be filled completely, so that bags can be picked up by the neck again for further handling. Hand should not be put under the bag.
👉At a time only one bag should be lifted.
👉Manual handling of waste bags should be minimized to reduce the risk of needle prick injury and infection.

Transport to Final Disposal Site

- Transportation from health care establishment to the site of final disposal in a closed motor vehicle (truck, tractor, trolley etc.) is desirable as it prevents spillage of waste on the way.

- Vehicles used for transport of BMW must have the “Bio Hazard” symbol and these vehicles should not be used for any other purpose.

TREATMENT OF WASTE

As per the Biomedical Waste (Management and Handling) Rules 1998, the treatment is defined as “a method, technique or process designed to change the physical, chemical or biological characteristics or composition of any biomedical waste so as to render such waste non hazardous to health and environment.”

Factors on which the final choice of treatment method should be made:

👉Disinfection efficiency;
👉Health and environmental considerations;
👉 Volume and mass reduction;
👉 Occupational health and safety considerations;
👉 Quantity of wastes for treatment and disposal/capacity of the system;

👉Types of waste for treatment and disposal; Infrastructure requirements;

👉Locally available treatment options and technologies;

👉Options available for final disposal;

👉Training requirements for operation of the method;

👉Operation and maintenance considerations;

👉Available space;

👉Location and surroundings of the treatment
site and disposal facility;
👉 Investment and operating costs;
👉 Public acceptability;
👉Regulatory requirements

The containers for storage of waste should have the following characteristics:

- Capacity to handle the volume of waste
- Suitability
- Reliability
- Easy to operate
- Easy to maintain
- Economic
- Environment friendly

CHEMICAL METHODS

Chemical Oxidation and Reduction

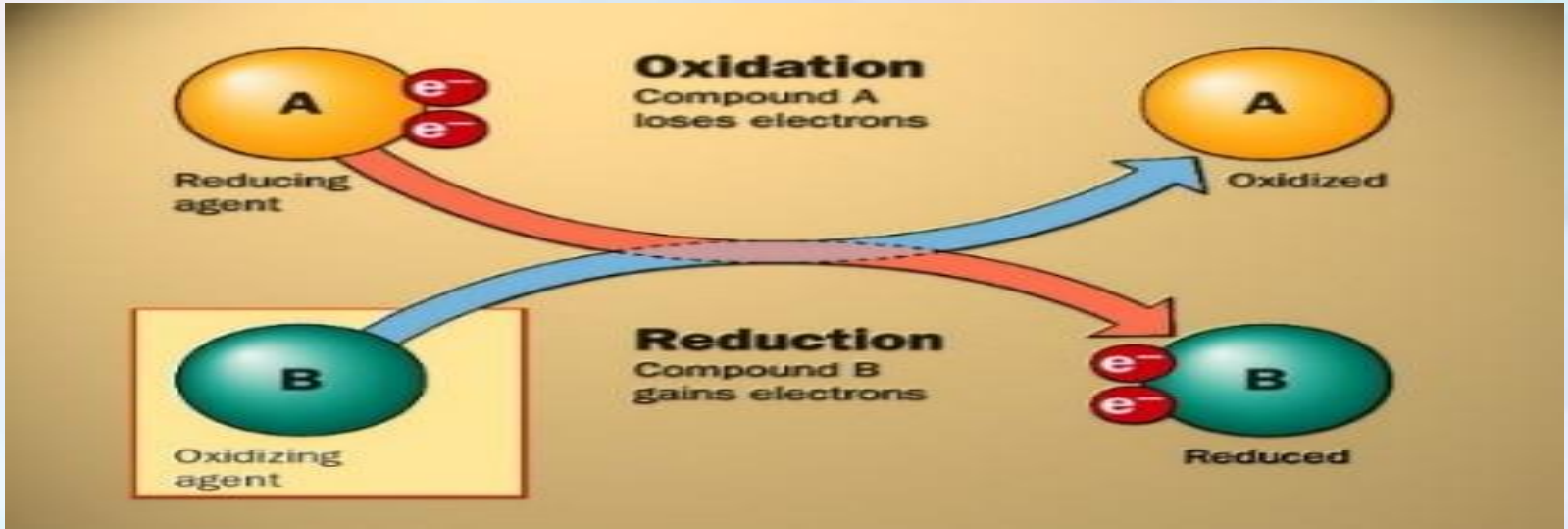
- Oxidation of cyanide wastes from metals is done using chlorine in alkali solution. The chlorination reaction oxidises cyanates into simple carbon dioxide and nitrogen gas.

- Reduction of hexavalent chromium to trivalent chromium is done using sulphur dioxide as a reducing agent.

A large variety of oxidisable contaminants in waste water and sludge are oxidised by ozone which can be generated on site by an electrical discharge through dry air or oxygen.

$$CH_2O + 2[O] \rightarrow CO_2 + H_2O$$

$$CH_3CHO + [O] \rightarrow CH_3COOH$$



ACID BASE NEUTRALISATION

- Generally acidic wastes are neutralised with slaked lime in a continuously stirred chemical reactor. The rate of addition of lime is controlled by feedback control system which monitors pH during addition.
- Alkaline wastes may be neutralised by adding sulphuric acid. It is relatively inexpensive acid. Alkaline wastes can also be neutralised by bubbling gaseous carbon dioxide forming carbonic acid. The advantage of carbon dioxide is that it is often readily available in the exhaust gas from any combustion process at the treatment site.

Hydrolysis

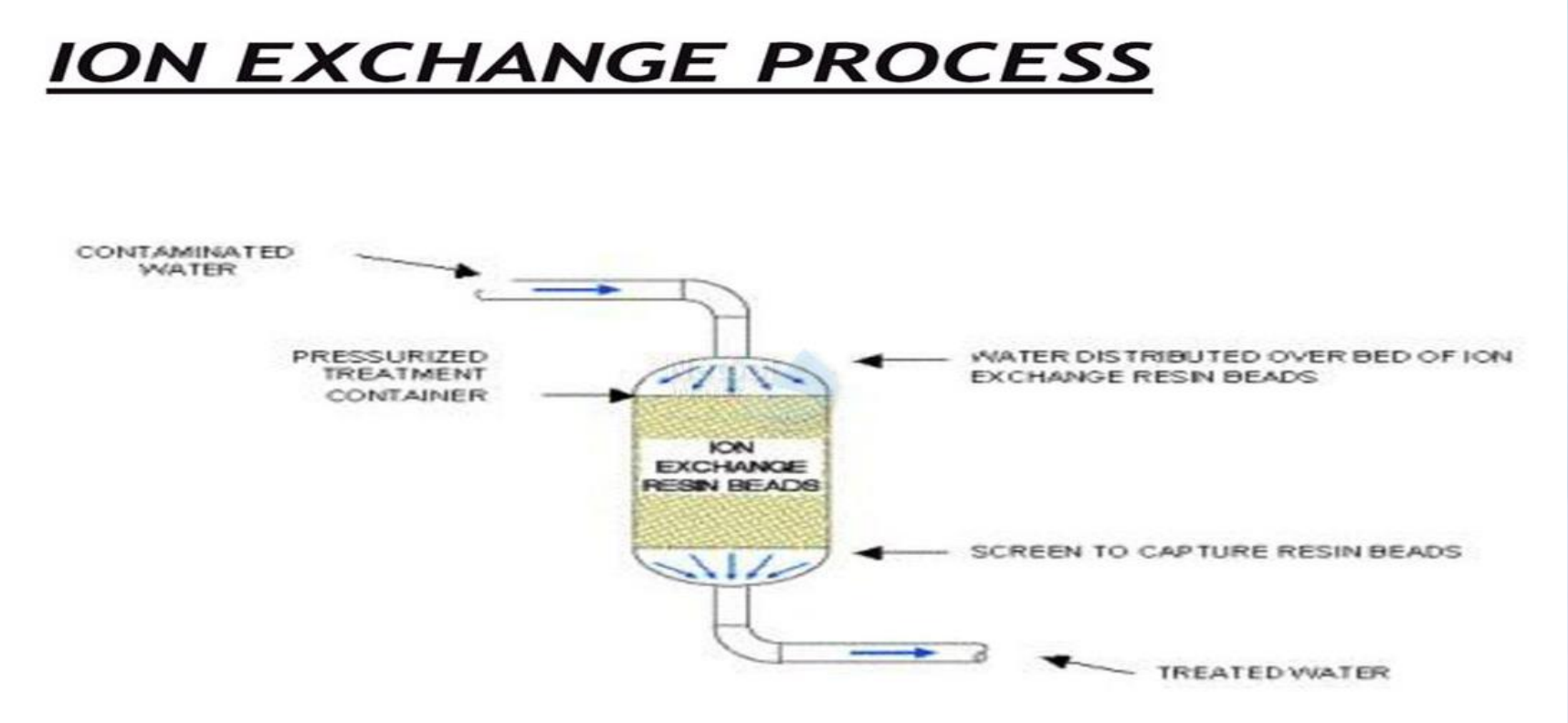
This treatment can be given to those hazardous wast constituents who are very reactive with water.

Chemical Precipitation

This technique can be applied to almost any liquid waste stream containing a precipitable hazardous constituent. By properly adjusting pH, the solubility of toxic metals can be decreased,leading to the formation of precipitate that can be removed by setting and filtration.

Ion Exchange Method

Ion Exchange Resins have been used in the removal of radionuclides from radioactive waste.



Disinfection

One of the effective chemical methods of waste treatment is disinfection. The disinfection can be defined as “the process by which most of the pathogens are destroyed from any inanimate object, surface or materials.” When this process is done by chemicals it is called chemical disinfection.

Common chemicals used for disinfection are:

👉 Bleaching powder for toilets, washrooms and urinals.

👉 1 % solution of bleach

👉 Alcohol 70 % for hand wash

👉 Gluteraldehyde 2 % like Cidex for disinfection of surfaces of instruments

👉 Detergents with enzymes for cleaning of endoscopes

👉 Savlon 1 % for thermometers, cheatle forceps etc.

Factors affecting Disinfection

- Types of organism present
- Temperature and pH
- Microbial load
- Concentration of disinfectant
- Amount of organic matter present
- Nature of the surface
- Length of contact time
- Types of water used (Hard or Soft)

New disinfectants used in the hospital

👉 Orthophtaldehyde (Cidex)

👉 Antimicrobial coating

👉 Superoxide Water- Rapidly effective in less than 2 min and reduce the microbial count up to 5 log 10. It is effective against mycobacterium, virus, fungi and spores.

?? Endocleans-This is a chemical sterilization system particularly used in Endoscope reprocessing system (machine controlled by computer).Chemical sterilant is Performic acid generated by Hydrogen Peroxide and formic acid. It is effective against wide range of bacteria and spores in less than 30 minute time.

👉 Chemical method of microbial control is also the use of halogens, Chloramines and Sodium Hypochlorite.

👉 Non carcinogenic 11% v/v stabilised Hydrogen peroxide and 0.1 % Silver.

👉 The combination of Formaldehyde, Potassium Permanganate and Ammonia usually used in fogging of OT.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Thank You!