

# THE BIOMEDICAL WASTE MANAGEMENT IN PROSTHODONTICS

Dr shivani kotewar : MDS 2 yr student in dept of prosthodontics at Csmss dental college,  
Aurangabad

Dr Nazish Baig : Professor and guide in dept of prosthodontics in Csmss dental college,  
Aurangabad

Dr Babita Yeshwante : HOD and guide at Csmss dental college, Aurangabad

Dr Vivek Jadhav : Professor and guide in dept of prosthodontics in Csmss dental college,  
Aurangabad

Dr Ruchi kasat : Professor and guide in dept of prosthodontics in Csmss dental college,  
Aurangabad

Dr Prasad Adhasure : Professor and guide in dept of prosthodontics in Csmss dental college,  
Aurangabad

Dr Singdha Patil : Mds I yr student in dept of prosthodontics in Csmss dental college,  
Aurangabad

## **ABSTRACT :**

Inappropriate and inadequate handling of biomedical waste may have serious public health consequences and a significant impact on the environment. It is necessary to manage infectious materials to prevent or reduce exposure of persons and the environment to potentially harmful bio-waste. Dental clinics generate a number of biomedical wastes. Dental Practitioners are becoming increasingly concerned about the potential impact of dentistry on the environment and often take voluntary measures to reduce the production and release of environmentally unfriendly wastes from their practices. So it is important for the dentist and prosthodontics to specific should have knowledge how to manage and prevent biohazards components.

## **KEYWORDS :**

Bio-hazard symbol, biomedical waste management, color coding, dentistry

## **INTRODUCTION :**

The term biomedical waste has been defined as “any waste that is generated during the diagnosis, treatment, or immunization of human beings or animals, or in the research activities pertaining to or in the production or testing of biological and includes categories mentioned in Schedule I of the Biomedical Waste (Management and Handling) rules 1998.[1] Dentistry is a profession dedicated for promoting and enhancing oral health leading to the overall wellbeing of an individual. While accomplishing this, dentists are likely to be exposed to various biological health hazards. This can include medical waste, samples of microorganism, prions, virus or toxin (from biological source) that can impact human health. Dental office generates a number of hazardous wastes that can be detrimental both to the dentists and the environment if not properly managed and dental practitioners have been increasingly prone to be exposed

to these biohazardous waste materials. So it is important for the dentist to have a basic knowledge biomedical wastes and its disposal.

Bio-Medical Waste Rules (1998) The Ministry of Environment and Forests notified the “Bio-Medical Waste (management and handling) rules in July 1998. In accordance with these Rules, it is the duty of every “occupier” i.e. a person who has the control over the institution and or its premises, to take all necessary steps to ensure that waste generated is handled without any adverse effect to human health and environment. [2,3 ]

### **OBJECTIVES OF BIOMEDICAL WASTE MANAGEMENT :**

1. To prevent transmission of disease from patient to patient, from patient to health workers and to prevent injury to the health care workers in support services, while handling biomedical waste.
2. To prevent general public exposure to the harmful effects of the cytotoxic, genotoxic, and chemical biomedical waste.

### **CATEGORIES OF BIOMEDICAL WASTE:**

Bio-Medical wastes have been categorized into ten different categories as mentioned below :–

Category No.1 Human Anatomical (human tissues, organs, body wastes parts)

Category No.2 Animal Waste (animal tissues, organs, bleeding parts, fluid, experimental animals used in research, waste generated by veterinary hospitals, discharge from animal houses)

Category No.3 Microbiology & Biotechnology waste (waste from laboratory cultures, stocks or specimens of microorganisms live or attenuated vaccines, human and animal cell culture, waste from production of biological toxins, dishes and devices used for transfer of cultures)

Category No. 4 Sharp Waste (needles, syringes, scalpels, blades, glass. It includes both used and unused sharps).

Category No. 5 Discarded Medicines (waste comprising of outdated contaminated and discarded medicines).

Category No. 6 Solid Waste (items contaminated with blood, and body fluids including cotton, dressings, solid linen, plaster casts, beddings, other material contaminated with blood).

Category No. 7 Solid Waste (wastes generated from disposable items such as tubing's, catheters, intravenous sets etc.).

Category No. 8 Liquid Waste (waste generated from laboratory washing, cleaning, housekeeping and disinfecting activities).

Category No. 9 Incineration Ash (ash from incineration of any bio-medical waste)

Category No.10 Chemical Waste (chemicals used in disinfection etc.) [4]

### According to Nancy Godwin:[5]

1. General waste (nonregulated)
2. Contaminated waste: a. Regulated and b. Infectious waste
3. Hazardous waste: a. Regulated and b. Toxic waste.

### According to US Centers for Disease Control and Prevention Guidelines wastes are classified in the following ways.[6,7]

Anatomic biomedical waste : Pathologic waste: Blood, blood products, bodily fluids, and tissues. 2. Infectious waste: Culture infectious agents, associated biological (e.g., culture flasks, petri plates, specimens, vaccines, wastes from the production of biological, chemicals, disinfectants, sterilizing agents.

Infectious waste is that part of medical/dental waste that has been shown through controlled studies capable of transmitting an infectious disease. Infectious medical/dental waste is also known as regulated waste.[8-11]

Nonanatomic biomedical waste Waste from dental materials/equipment/disposables that appear to be medical waste: . Mercury-containing: Elemental mercury, scrap amalgam. 2. Silver-containing: Spent X-ray film, undeveloped film. 3. Lead-containing: Lead foils packets, lead aprons, broken

of soldering and welding, cadmium will evaporate. This represents a problem with the need for availability of an adequate fume extraction system. In response to this hazard, the use of solders containing cadmium has also been largely discontinued.

### Implant materials

A wide variety of materials have been used in dental implants, including polymeric materials, alloys, ceramic, and synthetic hydroxyl-apatite. The most frequently used materials have been cobalt–chromium alloys, vitreous carbon, titanium, and aluminium oxide. . The concept of “osseointegration” associated with the titanium implants, as demonstrated by Branemark, has proved much of the biological basis for modern implantology. With an increasing application of nanotechnology in life sciences and medicine, further studies are required on biosafety evaluations of NPs with attention to nanotoxicology not only from the angle of environmental science but also based on the aspect of biomedical applications.[15]

### Cements

Zinc phosphate cement has been, and still is, the most frequently used luting agent for crown and bridges. Eugenol is a known cytotoxic and allergic substance. Clinical reports have indicated a high frequency of postluting sensitivity with Glass Ionomer cements. Pulp studies generally indicate slight reactions, but somewhat more to the luting type than to the restorative type of glass ionomer materials. A recent clinical study of pulp sensitivity following cementation with zinc phosphate and glass ionomer cements showed less sensitivity to zinc phosphate than to glass ionomer during the first 2 weeks, but after 3 months, there were no differences. Espelid et al.[16] The pressure on the dentine exerted during cementation was

thought to play a possible role on the observation. Modern resin-based luting cements are also well tolerated to pulp

### **The World Bank's health care waste management guidance, note lists four steps to healthcare waste management:**

1. Segregation of waste products into various components that include reusable and disposable materials in appropriate containers for safe storage;
2. Transportation to waste treatment and disposal sites;
3. Treatment; and
4. Final disposal.[17]

**Segregation** The “key for waste management” is waste segregation. Only a segregation system can ensure that the waste will be treated according to the hazards of the waste and that the correct disposal routes are taken, and the correct transportation equipment will be used. Recycling can be only carried out if recyclable materials are separated from the hazardous waste. Contaminated materials are excluded from any recycling activity, and they must be treated as mixed hazardous waste. Without effective segregation system, a complete waste stream must be considered as hazardous. ) Segregation should:

- Always take place at the source, that is at the ward bedside, Operation Theatre, Medical Analysis Laboratory, or any other room or ward in the hospital where the waste is generated;
- Be simple to implement for the medical and ancillary staff and applied uniformly throughout the country; *f* Be safe and guaranty the absence of infectious HCW in the domestic waste flow;
- Be well understood and well known by the medical and ancillary staff of the HCFs;
- Be regularly monitored to ensure that the procedures are respected.

The correct segregation is the clear responsibility of every waste generator. If the waste is unclear or not recognizable, then that waste must be classified in the highest to be expected risk group. Segregated waste should not be mixed during transport and storage. If hazardous and nonhazardous wastes are mixed, the entire mixture must be considered and treated as hazardous waste. Only a segregation system can ensure that the waste will be treated according to the hazards of the waste and that the disposal routes are taken.[18,19]

**Color coding** of the segregated waste Color coding means to combine different waste groups with “similar hazards in one main group” in a fast and easy way by a fixed color.

The different waste groups have different colors for the containers/bags for the identification according to the hazards and applied throughout the complete disposal chain, that is, segregation, collection, storage, transport, and disposal.

Warning colors are red, yellow, and orange used for hazardous waste; positive colors are blue, and green used for recycling; and neutral color is black for normal waste.

**Yellow color container/bag** should go for incineration/ deep burial,  
for categories - 1, 2, 3, and 6;

**Red bag** : should be sent for autoclaving/chemical treatment;  
**categories** - 3, 6, and 7

**Blue/white** with categories - 4 and 7 to autoclaving/chemical treatment and destruction/shredding;

**Black with categories** - 5, 9, and 10 for disposal in secured landfill.

Impression compound, agar, dental waxes, green stick compound, impression pastes, shellac base plates should be kept in a “yellow plastic bag” then sent for either incineration or deep burial. Rubber base impression material, investment material, pumice, acrylic, metal dust, alginate, old models, and casts, old acrylic dentures and teeth kept in a “black plastic bag” and dispose of in municipal dump.

Generally, waste should not be stored for >30 days.

### **Treatment of Bio-medical waste**

1. Technology option for ‘treatment’
  - i. Chemical processes
  - ii. Thermal processes
  - iii. Mechanical processes
  - iv. Irradiation processes
  - v. Biological processes
2. Points to ponder in processing waste
  - i. Radioactive waste from medical establishments
  - ii. Mercury control
3. Waste minimization

**Disposal** the various disposal methods are available for proper disposal of biomedical waste which includes incineration, autoclaving, chemical methods, thermal methods (low and high), ionizing radiation process, and deep burial and microwaving. “The medical waste should be completely free of pathogenic bacteria before disposal”. Incineration and autoclaving are considered traditional methods. Chitnis et al.[20] have devised a solar heating system for disinfecting infectious waste in economically less developed countries. They stated that considerable reduction in the amount of viable bacteria by this method. Untreated medical waste can be disposed off in sanitary landfills. Disposal without treatment is not recommended for human tissues, sharps and culture from clinical laboratories. Practically all infectious waste

must first be treated, whereas ordinary solid or liquid waste requires no treatment before disposal.

Teeth without amalgam restorations and other tissues can be placed directly into a biohazard bag or a sharps container, which can then be sterilized. Teeth with amalgams could release mercury vapor during sterilization, thus they should be neutralized through disinfection ideally, immersion for 30 min in a fresh solution of a tuberculocidal disinfectant held within a sealed container. Treated teeth can then be rinsed with water and are ready for disposal. Teeth without amalgam restorations can be placed directly into a biohazard bag or sharp container.[21] Items heavily soiled with blood/saliva can be placed into sharps containers. However, it may be easier to store them in small biohazard bags until treated. Used anesthetic capsules should be placed into sharps containers.

All the generators of biomedical waste should adopt universal precautions and appropriate safety measures while doing therapeutic and diagnostic activities and also while handling the biomedical waste. It should be ensured that, drivers, collectors, and other handlers are aware of the nature and risk of the waste. Written instructions should be provided regarding the procedures to be adopted in the event of spillage/accidents. Protective gears provided and instructions regarding their use are given. Workers are protected by vaccination against tetanus and hepatitis B.

## **CONCLUSION :**

Dental practitioners are becoming increasingly concerned about the potential impact of dentistry on the environment and often take voluntary measures to reduce the production and release of unfriendly wastes from their practices. As health practitioners, we should be concerned with promoting not only human health and well-being but also that of the environment. With the low incidence of adverse effects of the materials in present use, this will satisfy the needs of the patients and those handling the materials. Reliable research information using robust methodology is thus needed to clarify the various safety issues and frequency of adverse reactions in general dentistry, including prosthodontic treatment.

## **REFERNCES :**

1. Govt. of India. Bio-medical waste (management and handling) rules. The Gazette of India. Ministry of Environment and Forest; 1998.
2. Da Silva, Hoppe Ravenello M. Biomedical Waste (Management and Handling) Rules 1998, Ministry of Environment and Forests Notification. Waste Management , 25:
3. Radha K.V. A Case Study of Biomedical Waste Management in Hospitals. Global Journal of Health Science , 13:12-18 (2009).
4. MENSUDAR 203 et al. , Biomed. & Pharmacol. J., Vol. 4(1), 201-205 (2019)
5. Goodwin N. Lab procedures and waste management module-8. Available from: <http://www.sngoodwintraining.com/resources/Lab+Procedures+and+Waste+Management.ppt>. [Last accessed on 2011 July 3].
6. Harrison B, Nicosia J. States act to regulate medical waste. J Am Dent Assoc 1991;122:118-20.

7. Parkash H, Kohli A, Chaudhary S, Hallikeri K. Biomedical and dental waste management: An essential component of asepsis in dental clinics. *Dentistry India*; 2011. BIO waste-scribed. Available from: <http://www.scribd.com/doc/63117257/Bio-waste>. [Last accessed on 2011 July 6].
8. Gordon JG, Denys GA. Infectious wastes: Efficient and effective management. In: Block SS, editor. *Disinfection, Sterilization and Preservation*. 5th ed. Philadelphia, PA: Lea & Fibiger; 2001. p. 1139-57.
9. Kohn WG, Collins AS, Cleveland JL, Harte JA, Eklund KJ, Malvi DM, et al. Guidelines for infection control in dental health-care settings – 2003. *MMWR Recomm Rep* 2003;52:1-61.
10. Palenik CJ. Managing regulated waste in dental environments. *J Contemp Dent Pract* 2003;4:76.
11. Palenik CJ, Miller CH. *Infection Control and Management of Hazardous Materials for the Dental Team*. 3rd ed. St. Louis, MO: Mosby; 2004. p. 177-88.
12. De Melo JF, Gjerdet NR, Erichsen ES. Metal release from cobalt-chromium partial dentures in the mouth. *Acta Odontol Scand* 1983;41:71-4.
13. Churgin LS, Payne JC. Sensitized tissue response to an ethylene amine derivative transitional crown material. *J Prosthet Dent* 1981;46:179-80.
14. Carmichael AJ, Gibson JJ, Walls AW. Allergic contact dermatitis to bisphenol-A-glycidyl dimethacrylate (BIS-GMA) dental resin associated with sensitivity to epoxy resin. *Br Dent J* 1997;183:297-8.
15. Zhang YF. The potential biohazards of nanosized wear particles at bone– prosthesis interface: Asia-Pac. *J Chem Eng* 2011;6:563-8.
16. Espelid I, Tveit AB, Tornes KH, Alvheim H. Clinical behaviour of glass ionomer 42 restorations in primary teeth. *J Dent* 1999;27:437-42.
17. Johannessen LM, Dijkman M, Bartone C, Hanrahan D, Boyer G, Chandra C. *Health Care Waste Management Guidance Note*. Washington, DC: The International Bank for Reconstruction and Development/The World Bank; 2000
18. Waste segregation and national colour coding approach. Available from: <http://www.defra.gov.uk/environment/waste/special/index.htm>. [Last accessed on 2011 Oct 29].
19. The key for waste management: waste segregation. Available from: <http://www.sazgarmed.com/portalimages/articlepdfs/segregation.pdf>. [Last accessed on 2011 Oct 28].
20. Chitnis V, Chitnis S, Patil S, Chitnis D. Solar disinfection of infectious biomedical waste: A new approach for developing countries. *Lancet* 2003;362:1285-6.
21. Hörsted-Bindslev P. Amalgam toxicity – environmental and occupational hazards. *J Dent* 2004;32:359-65.