

## Review Article

# BIOMEDICAL WASTE MANAGEMENT: A REVIEW

Abhijit Nayak<sup>1</sup>, Rahul Chopra<sup>2</sup>, Ravneet Kaur<sup>3</sup>

<sup>1</sup>Department of Oral Medicine and Radiology, Vyas Dental College & Hospital, Jodhpur, Rajasthan, India, <sup>2</sup>BDS, Manipal College of Dental Sciences Mangalore, Manipal University

<sup>3</sup>Private Practitioner, Shaken Singh Eye and Dental Hospital, Amritsar

### Abstract:

Improper biomedical waste management is alarming and it poses a serious threat to public health. Waste disposal improperly can result in an increased risk of nosocomial infections in patients and can lead to change in microbial ecology. This article aims to summarise various disposal methods, color coding of disposal bags and emphasis that efficient disposal of biomedical waste as well as amalgam scrap is vital to avoid critical issues related to safety of community health.

Keywords: Amalgam, Biomedical waste, Waste Color Codes.

Corresponding Author: Dr. Abhijit Nayak, Department of Oral Medicine and Radiology, Vyas Dental College & Hospital, Jodhpur, Rajasthan, India, E mail: abhijitnayakomr@gmail.com

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### INTRODUCTION:

Dental offices generate a large number of hazardous dental wastes such as chemical solutions, lead foil film backing, mercury, scrap dental amalgam, fluorescent tubes that when disposed improperly, could cause harm to the environment. This improperly disposed hazardous waste enters the food chain either via water or soil and can show harmful effects in animals and humans. Most chemical waste streams accumulating in ever-increasing amounts as those creatures are consumed by others higher up the chain. There are several ways that mercury from dental amalgam can get into the environment. Dental Amalgam particles are a source of mercury, which is known to be neurotoxic and nephrotoxic. Fetuses and newborn babies are more sensitive to mercury than adults.<sup>1</sup> Medical waste poses high risk to doctors, nurses, technicians, sweepers, hospital visitors and patients due to arbitrary Management.<sup>2</sup>

The biomedical waste management and handling rules have been notified in 1998. The rules were amended twice in 2000, primarily to address administrative matters. The rule makes it mandatory for the health

care establishments to segregate, disinfect and dispose their waste in an ecofriendly manner.<sup>3</sup>

According to the Bio-medical waste rules 1998 of India, Bio – Medical Waste is defined as “Any solid, fluid or liquid waste, including its container and any intermediate product, which is generated during the diagnosis, treatment or immunization of human beings or animals, in research pertaining there to, or in the production or testing of biological and the animal waste from slaughter houses or any other like establishments.”<sup>1</sup> Biomedical waste is mainly classified as biological and non biological waste, some waste may infectious or non infectious.<sup>2</sup>

This waste is potentially hazardous, the main hazard being infection, and may pose a serious threat to human health if management is indiscriminate and unscientific.<sup>4</sup> Waste disposal improperly can result in an increased risk of nosocomial infections in patients and can result in spread of various microbial diseases.

### Amalgam Waste Management

Similar to other materials, mercury also has potential to be hazardous if not managed

properly. Amalgam handling procedures reveals that critical issues for health related safety arises when mercury exists in either liquid or vapour form as it can be absorbed through the alveoli in the lungs at 80% efficiency and through the gastrointestinal tract at efficiencies of 0.01% for elemental, 7% for inorganic and 95 to 98% for organic.<sup>5</sup>

### Types of Amalgam Waste generated at dental clinics

- **Non-contact amalgam (scrap)** is excess mix leftover at the end of a dental procedure. Many recyclers will buy this clean scrap.
- **Contact amalgam** is amalgam that has been in contact with the patient. Examples are extracted teeth with amalgam restorations, carving scrap collected at chair side, scrap left on instruments and matrix bands and amalgam captured by chair side traps, filters, or screens.
- **Amalgam separators** that comply with ISO 11 143 capture over 95% of amalgam waste but also trap other treatment debris
- **Chair side traps** capture amalgam waste during amalgam placement or removal procedures (traps from dental units dedicated strictly to hygiene may be placed in the general waste).
- **Vacuum pump filters** or traps contain amalgam sludge and water. Some recyclers will accept whole filters, while others will require special handling of this material.
- **Amalgam sludge** is the mixture of liquid and solid material collected within vacuum pump filters or other amalgam capture devices.
- **Empty amalgam capsules** are the individually dosed containers left over after mixing precapsulated dental amalgam.<sup>6</sup>

Amalgam waste products can also be a part of the operatory air. Adequate fresh air should be mixed with existing office air and the dental office should be well ventilated. This is of particular interest when nowadays most of the dental offices are air conditioned. Work should be done in well ventilated spaces with fresh air exchange and outside

exhaust. If spaces are air conditioned, the filters of air conditioners should be replaced periodically.<sup>5</sup>

The guidelines issued by ADA recommends that only capsulated amalgam alloy complying with ISO 24234 should be used in dental clinics. Dental clinics must collect, store safely and forward for recycling as much amalgam waste as possible which includes used amalgam capsules, excess amalgam not placed in restorations, including that left on instruments and matrix bands, amalgam retained in chairs side traps, suction filters and amalgam separators and extracted teeth which have been restored with amalgam. Amalgam separators, which comply with ISO 11 143, should be installed in all dental clinics.<sup>6</sup> According to American Dental Association regulations, mercury contaminated materials should not be placed in medical waste bags because these are burned and mercury becomes vaporized.<sup>7</sup>

### Categorisation and color coding for biomedical waste disposal

Improper medical waste management is alarming and it poses a serious threat to public health.<sup>2</sup> According to management and handling rules (1998, Schedule I) items sent for incineration should be placed in yellow colour bags (e.g., human anatomical waste, microbiological waste, and soiled plastic waste), items that need to be sent for microwave or autoclave or chemical treatment should be placed in red coloured bags (e.g., infected plastic syringes, tubings, gloves, rubber dam sheets), the waste that need to be shredder after autoclaving or microwaving or chemical treatment is to be placed in blue or white translucent bags or containers (e.g., sharp containers for needles and used files).<sup>8</sup> Green biomedical waste bag is for pharmaceutical waste which includes non-hazardous pharmaceutical waste and controlled drugs and disposal route involves denaturing if the drugs are controlled then incinerated.<sup>9</sup>

### CONCLUSION:

In this century when healthcare providers are preparing to get vaccinations against present

pandemic diseases such as ebola virus, swine flu it is of utmost important to dispose of waste properly so that their hard work to

prevent epidemics does not go into vain as improperly disposed waste could be a reason for infections.

**Table 1: Categorisation, color coding and disposal method of biomedical waste<sup>4,10,11</sup>**

Type of Substance	Category	Color coded Bags	Disposal Method
Human anatomical waste (human tissues, organs, body parts)	1	Yellow	Incineration/ deep burial
Animal waste (animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, colleges and animal houses)	2	Yellow	Incineration/ deep burial
Microbiology & Biotechnology waste (wastes from laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, wastes from production of biologicals, toxins, dishes and devices used for transfer of cultures)	3	Red	Incineration/ autoclaving/ microwaving
Waste sharps (needles, syringes, scalpels, blades, glass, etc. that may cause disinfection. Both used and unused sharps)	4	Blue	Disinfection by chemical treatment/ autoclaving, microwaving and mutilation/ shredding
Discarded medicines & cytotoxic drugs. (wastes comprising of outdated, contaminated and discarded medicines)	5	Green/ Blue	Shredding and deep burial
Items contaminated with blood, and body fluids including cotton dressings, soiled plaster casts, lines, beddings, other material (Solid waste)	6	Blue	Disinfection by chemical treatment/ autoclaving, microwaving and mutilation/ shredding
Solid Waste generated from disposable items other than the waste sharps such as catheters, intravenous sets etc.	7	Blue	Disinfection by chemical treatment/ autoclaving, microwaving and mutilation/ shredding
Liquid waste (waste generated from laboratory and washing, cleaning, house-keeping and disinfecting activities)	8	White	Disinfection by chemical treatment and discharge into drain
Incineration ash (ash from incineration of any biomedical waste)	9	Black	Dispose in Municipal landfill
Chemical waste (chemicals used in production of biologicals, chemicals used in disinfection, insecticides, etc.)	10	Black	Chemical treatment/ discharges into drains for liquids and secured landfills for solids

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