



## Green Dentistry: A Review

Akshat Sachdeva<sup>1</sup>, Aditi Sharma<sup>1</sup>, Sumit Bhateja<sup>2\*</sup> and Geetika Arora<sup>3</sup>

<sup>1</sup>Dental Surgeon, Manav Rachna Dental College, India

<sup>2</sup>Department of Oral Medicine & Radiology, Manav Rachna Dental College, India

<sup>3</sup>Department of Public Health Dentistry, Inderprastha Dental College, India

### Abstract

In today's modern world, it is utmost necessary to understand the importance of being eco-friendly in every aspect of our lives, which also includes dental practice as it has a big impact on the environment and ecosystem due to the large amount of waste produced by various dental procedures along with excessive use of water and electricity, which specifically emphasis the need to move towards 'Green dentistry'. Green dentistry does not only mean environment friendly but is an innovation that reserves time as well as money by means of waste reduction, energy conservation and pollution deduction with the use of latest techniques and procedures thereby protecting the environment and the human from the menaces of rapid urbanization in developing countries.

**Keywords:** Green dentistry; Eco-friendly dentistry; Waste management

### Introduction

Eco-friendly dentistry is a new upcoming emerging trend in dentistry. It involves a high-tech approach, which reduces the environmental impact of dental practices in moving towards an ecologically sustainable health care system. It also encompasses a service model for dentistry that supports and maintains wellness. Eco-friendly dentistry is an approach to fulfill the necessities of patients and succors dental professionals to safeguard planetary and community well – being as well as financial health of their practices [1].

The color green helps in enhancing vision, stability and endurance. It also has healing power and is considered to be the most soothing and relaxing color [2].

The vital concepts of a green dental practice encompasses water and energy conservation, usage of non-toxic products, waste reduction and management, and abolition of high risk contagions that adversely affect the human race as well as the environment, and encourage 'green' products.

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#### \*Correspondence:

Sumit Bhateja, Department of Oral Medicine & Radiology, Manav Rachna Dental College, Faridabad, Haryana, India, Tel: 91-9891353960; E-mail: bhateja.sumit@gmail.com

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### Components of Green Dentistry

The Eco-Dentistry Association (EDA) has developed a model for eco-friendly dentistry that is environmentally conscious and wellness-based, helping dentists to protect the environment although integrating dental practices that advance preventive dentistry and serving the needs of green dentistry consumers. It includes four components [3]:

**Reduces waste and pollution:** Dental clinics generate a big number of biomedical waste products, including blood soaked materials, syringes etc. The waste should be properly disposed using color coding of waste categories.

The four procedures accountable for majority of the dental waste and contributing to pollution are [3]:

1. Placement and eviction of dental amalgam restorations.
2. Conventional X-ray systems.
3. Infection control methods including disposable barriers, sterilization items and toxic disinfectants.
4. Conventional vacuum saliva ejector systems.

Mercury is being used in the form of dental amalgam as a restorative material for more than 150 years [4]. Dental amalgam is 50% mercury with silver, tin and lead and other minerals that can contaminate the environment [5]. Once mercury enters water or soil, bacteria convert it into



Figure 1: Shows dental amalgam waste products.

methyl mercury, a potent neurotoxin that can cause brain, kidney and lung damage in humans. As severe as the consequences of mercury poisoning are, it's way too easy for people to reach high levels of exposure (Figure 1) [5].

Prevention from mercury pollution can be achieved by the following ways [6]:

- i. Usage of alternate substances like GIC, composite.
- ii. Incorporation of an amalgam separator in clinics.
- iii. Recycling waste amalgam.

All the conventional dental offices used traditional film X-rays. This technology has two significant environmental hazards: silver and lead. The source of pollution for silver is unused fixer and unused films and for lead, it is lead foil in film packet and lead apron/shield.

The different forms of waste generated as a result of X-ray processing in the dental offices are as follows (Figure 2) [7]:

- i. X-Ray equipment.
- ii. Undiluted developer.
- iii. X-Ray film: lead and silver.
- iv. Used fixer contains silver.
- v. Developer systems cleaner containing chromium.

Ways for preventing X-Ray waste pollution are [3]:

- i. Shift to digital imaging.
- ii. Usage of non-chromium system developer cleaners.
- iii. Capture waste lead.
- iv. Filter used fixer.

According to the new updated color coding for Biomedical Waste Management – 2016, waste should be disposed in suitable color bags as under [8]:

**1. Yellow:** Collected in colored non – chlorinated plastic bags or containers.

- Human anatomical waste: Human tissues, body parts, organs.
- Soiled waste: items contaminated with blood, plaster casts,

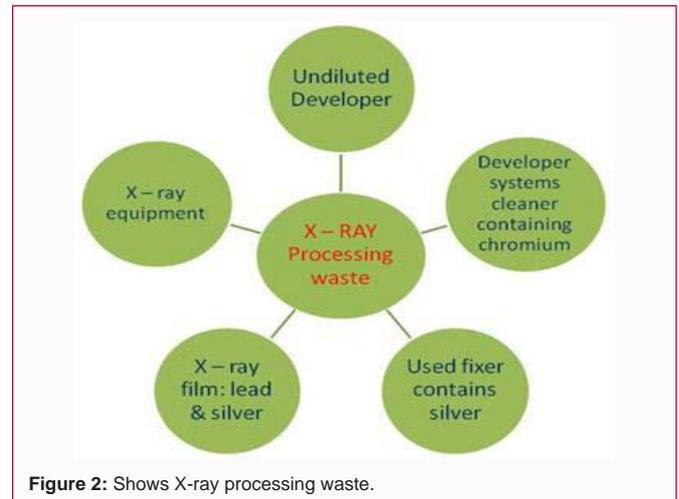


Figure 2: Shows X-ray processing waste.

cotton swabs, bag containing residual or discarded blood.

- Expired or discarded medicines: pharmaceutical waste including ampoules and vials.
  - Chemical liquid waste: X-ray film developing liquid, disposed formalin, contaminated secretions, aspirated fluids, liquid from laboratories and floor washings.
  - Microbiology, Biotechnology and other laboratory waste: culture media, stocks or specimens of microorganisms, live or attenuated vaccines.
2. **Red:** Collected in red colored non-chlorinated plastic bags or containers.
    - Polluted Waste resulting from use and throw articles such as tubes, bottles, intravenous tubes, catheters, urine bags, syringes etc.
  3. **White:** Collected in puncture-proof, leak-proof and tamper-proof containers.
    - Needles, syringes having immovable needles, needles from tip cutter or burner, scalpels, blades, or any other infected needle-like object.
  4. **Blue:** Collected in cardboard boxes with blue colored markings.
    - Glassware: Broken or discarded and adulterated glass objects including medicine vials and ampoules except those contaminated with cytotoxic wastes.
    - Metallic body implants.

**Saves water, energy and money:** Conservation is the mantra of future dentistry because it extends the life of our precious resources and in addition enables us to save money. We should make sure that when we leave the working premises next time, check and look for those ubiquitous blinking lights emanating from electrical equipment [9]. It can include computers, intraoral cameras, television, or lights left on when no one is in the office. By turning off these items, we can conserve a lot of energy drawn by these items that are plugged into the grid, but not in use [10]. An inspiring milestone in green dentistry's future is the present day instigation of energy- and water-saving dental equipment.

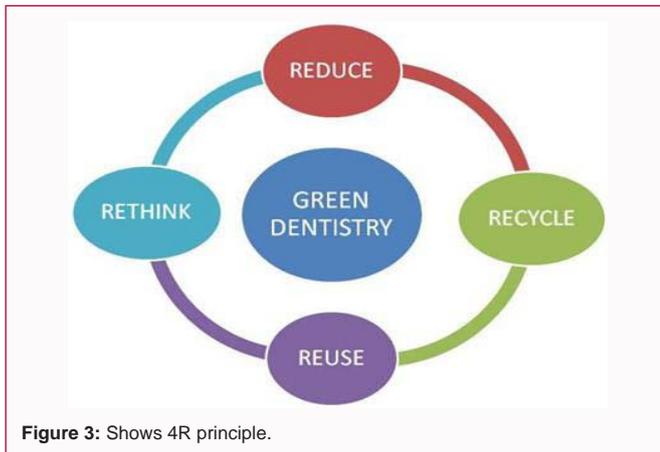


Figure 3: Shows 4R principle.

Use of LED operatory lights, which reduce electrical energy consumption by 70%, eliminating the need for expensive halogen bulbs is the need of the hour. Currently, manufacturers have come out with new waterless vacuum systems, which save about 360 gallons of water per day [9,10]. If every dental office is installed with one of these waterless systems, we could collectively conserve as many as nine billion gallons of clean, drinkable water a year [11,12]. Now think how green dentistry can put more “green” into our pocket. Reusable drinking cups and metal suction tips were used by 50% to 60% dentists. Its use should be promoted as this can be sterilized and is more eco-friendly [13].

**Is hi-tech:** High-tech alterations play a key role in helping dental professionals achieve their targets for waste deduction and resource conservation. Digital technologies proffer premature diagnosis, preventive therapies, and education that aim to serve the needs of wellness lifestyle patients committed to maintaining long-term eudemonia and seeking to avoid unnecessary or expensive procedures [14].

Here are some high-tech innovations that are part of dentistry's green future [15]:

1. Digital imaging system.
2. CAD/CAM systems.
3. Steam sterilizers eliminating the use of chemicals.
4. Digital patient charting, scheduling, and billing.
5. Digital paperless patient communication system such as E-mail appointments, reminders, and saving staff time.
6. Use of website to promote and as a primary marketing tool.
7. Switch to electronic patient record format.
8. Use of oil-free compressors.

**Supports a wellness lifestyle:** Wellness lifestyle dentistry engages the extensive knowledge of dental professionals in assessing the health of periodontal tissue as a window to overall health. The so-called lifestyle illnesses have been linked in scientific research to an out-of-balance immune response. The oral cavity is the window to the body's immune response [16]. Inflamed, bleeding gums are a signal that the body's immune response is compromised and on the verge of an ambush. Temporary bleeding or swelling might occur. Likewise, when microorganisms in the mouth become disproportioned,

periodontal cells indicate the need for an immune system attack. If the bacteria are not brought into the original state, the periodontal tissue can become the site of chronic inflammation. At the untimely stages this condition is called gingivitis, and at subsequent stages it becomes a state known as periodontitis or periodontal disease. It is estimated that as much as 80% of the population may suffer from periodontal disorder [16]. If left unattended, our body's own immune system dismantles the periodontal tissue and bones that hold our teeth in place. The unrestricted bacteria from the mouth can travel to various systems in the body *via* the bloodstream leading to long – standing disease in rest of the body organ systems as well. Orderly assessment of periodontium by an expert dentist is the prime method to make sure that our body is not in a chronic inflammatory state. Teeth's cleaning by a professional is one of the most important steps we can take to preserve total body wellness [16].

Tips for Maintaining Body Wellness through Dentistry [16]:

- Oral – bacterial equilibrium should be monitored by the dental professional under the aegis of salivary diagnostic test.
- It is the responsibility of the hygienist to perform perio – charting at each appointment, apprise you your results & thereby applying them to enhance your home care.
- Be sure to consume foods, and take supplements containing anti-oxidant and anti-inflammatory properties.
- Visit your dental professional regularly as per your recommended schedule.
- Follow your hygienists' home care injunctions.

## Benefits of Green Dentistry

Green dentistry is a whole - earth initiative to tooth care that diminishes the negative environmental impression of dentistry and construct a caring environment for the human race. It is based on the model of four R's – Rethink, Reduce, Re-use and Recycle (Figure 3) [17].

By adaptation of high technology and the use of good common sense, we can be a part of dentistry's clean, green and highly profitable future. This can be achieved by following the use of these simple things:

1. Sparingly use of energy - Dental procedures uses huge amount of electricity which can be reduced by using latest technologies such as motion sensors, turning off light and use of CFL in the clinics.
2. Sparingly use of water - Wastage of water should be avoided by turning off the tap during washing hands.
3. Minimize radiation - Usage of digital X-rays rather than conventional X-rays scales down the amount of radiation and the quality of the images will also be more improvised.
4. Reprocessing - Many materials found in a dentist's clinic can be recycled, including paper cups, paper, magazines, general waste and cloths which helps to reduce costs as well as waste.
5. Applying technology - Use of computers for the storage of data in relation to patient records will not only eliminate the paper usage but will be more accurate.
6. Reduced Chemical Contamination, Fewer Disposables – Green dental applications also employ superior – quality,

biodegradable disinfectants and steam sterilization techniques that minimize the requirement of ventilation for chemical vapors, or a hazardous waste sanction for getting rid of toxic chemicals into a water supply.

**More tooth – colored materials, Less Heavy Metal Waste –** Eco-dentistry embraces the modern world's metal – free dental restoratives using composite bonding or ceramic veneers and crowns.

## Conclusion

Green dentistry is an evolving approach to reduce the environmental impact from dental practice.

Green dentistry indeed lessens supply tariffs by amalgamating trending innovations, and multiplies productivity by methodical time manipulation, reducing wastage and thereby intercepting pollution. Ultimately patients get benefitted by quality treatment with reduction in treatment costs. So let us go green today and save mother Earth from biohazards for a better tomorrow.

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