Eco- friendly dentistry is currently transforming the medical field to decrease its affect on our natural environment and reduce the amount of waste being produced. By combing the health of humans with the health of our environment, eco friendly dentistry provides an opportunity to reduce further degradation[1] of our planet. The health industry has a detrimental affect on our environment, including the vast amounts of energy used each year and the colossal sum of waste produced by hospitals and medical clinics. Eco friendly dentistry uses a sustainable[2] approach to encourage dentists to implement new strategies to try and reduce the energy being consumed and the large amount of waste being produced by the industry. Health professionals are on the leading edge of helping to heal our planet by introducing the four R's; Rethink, Reduce, Reuse, and Recycle (Pockrass & Pockrass, 2008). By implementing these four easy steps, dentists and dental hygienists are beginning to transform the medical industry into a more sustainable one.

Contents

1. Dentistry
2. Medical Waste
    - 2.1 Landfill vs. incineration
    - 2.2 Green house gases and climate change
3. Eco-friendly dentistry
    - 3.1 The Four R's
        - 3.1.1 Rethink (green building)
        - 3.1.2 Reduce
        - 3.1.3 Reuse
        - 3.1.4 Recycle
4. Innovations and Recommendations

Dentistry

Dentistry is defined as the "evaluation, diagnosis, prevention and/or treatment (nonsurgical, surgical or related procedures) of diseases, disorders and/or conditions of the oral cavity[3], maxillofacial area and/or the adjacent and associated structures and their impact on the human body" (American Dental Association). People who practice dentistry are known as dentists. They practice in according to the ethics of the profession and to the law (American Dental Association). Other people that work in the oral health industry include dental hygienists, dental assistants, and dental technicians. Dentistry, among other fields in the medical industry contributes to climate change and increasing the pollution of our environment (Adams, 2007).

[1] **Degradation** is changing to a lower or less respected state
[2] **Sustainable** is a characteristic of a process or state that can be maintained at a certain level indefinitely
[3] **Oral Cavity** is the cavity that receives food for digestion

Medical Waste

Landfill and Incineration

The industrial world produces large amounts of waste each year and the medical industry plays a crucial role in producing and adding to the amount hauled off to landfills. The waste is dropped off at landfill sites and it begins its destructive path. The landfill begins to destroy the material, rather then conserve it (Platt, B, et al, 2008). Raw and new materials are being exploited because of the increase in expelling of waste at landfills and incinerators. More then two thirds of the material used in the United States is dumped into landfills each year, despite the encouragement of recycling (Platt, B., et al, 2008). Many environmental and health issues stand testament to the need to reduce waste deposited in landfills each year. Many pollution problems are a result of existing landfills (Atiyat & Mosa, 2002). Contamination of the groundwater[4] and aquifers[5] by leakage produced by the decaying matter and the off gassing[6] of methane gas from the decaying organic waste are the leading causes of environmental harm from landfills. Hazardous waste that is deposited from hospitals and medical clinics can seep into the ground and infectious diseases can spread rapidly. Incinerators[7] are commonly used to dispose of this type of hazardous waste. The by-products of incinerators such as carbon dioxide and sulphur dioxide (green house gases[8]) can cause harm to humans and the environment and further global warming (Atiyat & Mosa, 2002). Incinerators produce ash from the burning waste and can be a source of environmental contamination (Berg & Hager, 2007).

Figure 1: Landfill site with an incinerator on the grounds

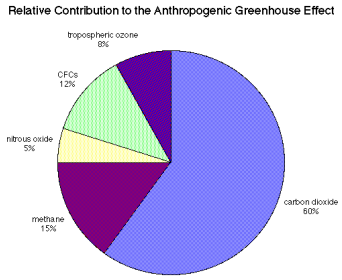
See Appendix 1

[4] **Groundwater** is water the infiltrates the soil and is located in underground reservoirs called aquifers
[5] **Aquifer** is an underground layer of water-bearing porous stone, earth or gravel
[6] **Off gassing** are emissions of gases from a material
[7] **Incinerator** is a furnace that burns refuse
[8] **Green house gases** contribute to the greenhouse effect by absorbing infrared radiation

Green House Gases and Climate Change

Atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased significantly since the 1960s (Cunningham & Cunningham, 2008). The leading cause of anthropogenic[9] climate change is the emission of carbon dioxide, as it is the most abundant green house gas in the environment (Cunningham & Cunningham, 2008). The burning of forests and grasslands for urbanization and other human related activities release 30 billion tons of carbon dioxide each year (Cunningham & Cunningham, 2008). Methane is a green house gas that most commonly released in landfills and can absorb 23 times as much infrared radiation as carbon dioxide consequently warming the Earth's surface.

Figure 2: Proportions of Green House Gases, light blue denotes carbon dioxide



See Appendix 2

Eco-Friendly Dentistry

Eco-friendly dentistry attempts to reduce the industries detrimental impact on the environment and promote environmental awareness and sustainability to patients. It is an approach of dentistry that encourages sustainable practices by reducing resource consumption and waste. Eco-friendly dentistry also tries to increase the health of patients by reducing chemical use in the clinics and using low volatile[10] paints (Adams, 2007). Patients are encouraged to take part in sustainability in many ways such as decreasing water consumption while brushing their teeth. A sustainable practice takes the cooperation of the dentist and the patient. Eco-friendly dentist offices take into consideration patient volume, consumption of dental resources, electricity, energy, chemical and water usage, and waste and try to implement environmentally friendly alternatives (Adams, 2007).

Figure 3: Dentists chair at an eco- friendly dentists office

See Appendix 3

[9] **Anthropogenic** is made by or a result of human activity

[10] **Low volatile paints** are non toxic paints that release low level of toxins into the environment

The Four R's

The four R's is a strategy implemented by dental professionals to help make an easier transition to a more sustainable practice.

Rethink- Every decision is made with a certain mindset, and redeveloping a mindset is a strategy for change. Environmentalism and sustainability are both considered states of the mind (Pockrass & Pockrass, 2008). Rethinking the way that dentist offices are run is the initial step in trying to change the modern practice. Implementing simple changes like things you can add or change, and decrease energy and water consumption are the initial strategies to consider (Pockrass & Pockrass, 2008).

Reduce- In order to decrease the pressure on the Earth's resources, people must decrease or reduce their consumption of them. For example to prevent deforestation[11] of forests, and slow down global warming we must reduce our consumption of paper and production of waste respectively.

Reuse- This strategy encourages the prolonged use of item; to prevent the item from contributing to waste being put in landfills. Finding a new purpose for an item extends its life and decreases contributions to landfills. By reusing items, we take the pressure off of natural resources by decreasing the demand for extraction[12]. By reusing products, it also reduces the amount of energy needed to produce new products.

Recycle- Much of the waste that is found in landfills can be reprocessed and recycled into a new product. To reduce the waste of useful products, reduce the waste of raw materials and energy needed to extract the materials, reduce water pollution and air pollution from landfills and incinerators respectively, recycling products is a viable way to reduce overall contamination of the environment (Berg & Hager, 2007). It is a crucial component of the management of waste hierarchy. Figure 4 demonstrates all of the material that is considered recyclable.

See Appendix 4

[11] **Deforestation** is the removal of trees

[12] **Extraction** is the action of taking out something

Innovations and Eco-friendly Dental Products

There have been many technologies designed to enhance the sustainability of dental practices. Simple rethink, reduce, reuse, and recycle steps are the initial ones to implement in the clinic before applying more advanced technologies. Reducing the amount of disposable autoclave[13] wraps and disposable bibs can be done by using a sterilization program. Clinics can use reusable cotton towels instead of disposable plastic or paper bibs as seen in Figure 5 (Farahani, 2007). The clinic can use the neighbourhood recycling program to reduce the amount of recyclable items being disposed in landfills. To reduce the water consumption of the clinic they can use a dry dental vacuum pump[14] that saves over 42 gallons of potable water per year instead of wet pumps (Farahani, 2007). One time use plastic syringes can be replaced by stainless steel syringes that can be sterilized and reused multiple times. There are many low cost, eco friendly and simple options that dentists can implement in their clinics (Adams, 2008):

-use energy star washing machines and dryers
-use florescent lighting
-use low volatile paints
-use digital radiology instead of film based x-rays

All of these options are easy to access and are economically and financially viable. Simple steps can be taken to reduce the environmental contamination produced by a dental practice.

Figure 5: Paper bibs compared to one recycled cloth towel
See Appendix 5

Figure6: Stainless steel syringe compared to multiple one use plastic syringes
See Appendix 6

[13] **Autoclave** is an equipment that is used to clean dental instruments that uses super heated high-pressure steam

[14] **Vacuum pump** is a pump used to evacuate air from a container to create a vacuum

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Appendix

Appendix 1: http://climatex.org/media/images-image-image/Garbage_landfill.jpg

Appendix 2: http://eesc.columbia.edu/courses/ees/slides/climate/g_effect.gif

Appendix 3: http://www.ecodentistry.org/displaycommon.cfm?an=5

Appendix 4:
http://images.google.ca/imgres?imgurl=http://www.hackney.gov.uk/recycling-2.jpg&imgrefurl=http://www.hackney.gov.uk/greenbox.htm&usg=__3_Q7nNM7AjVfQ3ZiEmUROefj0JY=&h=323&w=360&sz=51&hl=en&start=40&um=1&tbnid=ciTNn4ctHnEn5M:&tbnh=109&tbnw=121&prev=/images%3Fq%3Drecycling%26start%3D20%26ndsp%3D20%26um%3D1%26hl%3Den%26client%3Dfirefox-a%26rls%3Dorg.mozilla:en-US:official%26sa%3DN

Appendix 5: http://www.cda-adc.ca/jcda/vol-73/issue-7/581.pdf

Appendix 6: http://www.cda-adc.ca/jcda/vol-73/issue-7/581.pdf