Biomedical waste management in rural areas using solar powered thermal autoclave technique

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ABSTRACT

Health care is integral for human well being. Biomedical wastes prevailing in hospitals must be separated and disposed in hygienic and cost effective manner such that it minimizes the risk to public health and environment. It is ironic that a survey shows biomedical wastes cause 10-15% of infection among public. Among all biomedical wastes in hospital 5.7% are deep buried, 23.8% are incinerated, 9.5% are burned. It is pathetic that about 61% of biowaste disposal is unknown due to insufficient equipments, lack of access to electricity etc in rural areas. This leads poisoning of greenhouse gases and surrounding environment. Here we propose solar powered thermal autoclave technique that minimizes the risk of environmental pollution and contamination without electricity and cost effective. This technique collects the solar energy and transfers into heat and by conduction thermal energy is generated which sterilizes the biomedical wastes. Other proposed methods like chemical and radiation sterilization also induce different type of environmental hazards. Solar autoclave is an initial step to save our greenhouse gases and preserve earth from the environmental pollution occurring due to biomedical waste.

Keywords: Biomedical waste, Environmental Pollution, Solar powered- thermal Autoclave.

INTRODUCTION

Biomedical waste generated from health care system has become a serious source of infection and a means of spreading disease in healthcare delivery system. This includes waste produced by health facilities such as general hospitals, medical centres and dispensaries. However such residues when unmanaged transmit diseases and pose risks to patients, healthcare providers, waste pickers and community. All hospitals, health care centers, clinics, nursing homes, laboratories, veterinary clinics and other establishments must dispose waste materials based on the process of health care and treatment. Medical wastes include a larger portion of infectious wastes, which are possibly dangerous, because they may be resilient to treatment and possess increased ability to cause disease.

Over few decades the expansion of biomedical sector with an increase in the use of disposable medical products has contributed to the large amount of medical waste generated. In many countries, hazardous and medical wastes are still handled together with domestic wastes, leading a great health risk to municipal laborers, the public and the environment. Improper disposal of medical waste including open dumping and uncontrolled burning increases the risk of spreading infections and exposure to toxic emissions from incomplete combustions. This acts as a foundation for environmental problems in terms of air, water and soil pollution. These emissions can cause respiratory and skin diseases or even cancer, if precautionary protocols are ignored. The proper collection and disposal of this waste is of great importance as it can directly and indirectly impact the health risks to both public and the environment.

In spite of all the above factors this paper focuses on,

1. Impact of biomedical waste pollutants to Environment.
2. Solar Thermal Autoclave technique with contaminated water refiner.

Biomedical waste: The wastes generated from health care units are generally classified as infectious and non infectious. The infectious biomedical wastes are termed as hospital wastes and are considered to be potentially hazardous in nature. This waste is highly infectious and can be a serious threat to human health if not managed in a scientific and discriminate manner.

Environmental hazards of untreated biomedical pollutants: The improper disposal of crude biomedical pollutants carries acute risks to the environment including the pollution of surface, ground, and water sources. Definite types of biomedical pollutants are acknowledged to be bioactive even at low concentrations and can be non-degradable in the environment. This has both short-and long-term detrimental effects on the environment and potentially human health. The nature of pollutants can be classified into biological, chemical and radioactive.
## Table 1. Environmental health hazards due to biomedical waste

<table>
<thead>
<tr>
<th>Environmental problems</th>
<th>Biological</th>
<th>Chemical</th>
<th>Radioactive</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WATER POLLUTION</strong></td>
<td>Waste from laboratory cultures, alive or attenuated vaccines, human and animal cell culture used in research, waste from biological toxins.</td>
<td>Chemical &amp; heavy metal spills enter water Excess nutrients Leachates, Algal brooms- Eutrophication.</td>
<td>Radioactive spills, scintillation liquid, patient excretion.</td>
<td>Alters pH, Biological Oxygen Demand, Dissolved Oxygen, Chemical Oxygen Demand.</td>
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**Solar thermal autoclave refiner:** Solar thermal powered autoclave with EWS system is suitable for wet sterilization of medical instruments in remote and rural areas of developing countries. This system acquires energy from sunlight collected through semi parabolic black mirrors. The extracted energy transferred to aluminium plate through forced transmission. The high pressurized autoclav in presence of water kills all microbes, spores and viruses. The effluent contaminated water from autoclave is sent to high speed electro water separation recycler to obtain better removal of suspended contaminants without any chemicals. In the first step of recycling process electric impulses are applied to clump the contaminants and in second step the low power pulses generate micro-bubbles to lift the clumped contaminant for harvest.

**RESULT & CONCLUSION**

Apparently, the precarious biomedical pollutants emerge as a pathway for environmental contamination and besmirch greenhouse gases. So it is the need of hour to manage biomedical waste efficiently to stabilize greenhouse gases. Despite many incineration techniques, there is a lack in proper operation and maintenance especially in rural and remote areas. This technique in contrast utilizes solar energy directly; first step to reduce infections where 61% of biomedical waste dumped is unknown. It can be highly utilized in areas of large rural population supporting small hospitals and clinics with lack of reliability to electricity. It is cost-effective sustainable way to minimize pollution in rural areas of developing nations.

**REFERENCES**


