Chapter 11

Impact of Hazardous Waste Material on Environment and Their Management Strategies

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ABSTRACT

Hazardous waste has emerged as an issue of major concern that has negative impact both on human health as well as on the environment. Hazardous and infectious agents are handled in daily routine in biomedical laboratories. Their effects are increasing continuously in the environment. Hazardous waste includes solid, liquid, sharp and pathological waste. Workers in hospitals and health care, agricultural and fishing occupations are at particular risk of exposure to hazardous biological agents. Recently, more systematic and strict steps have taken by the Indian government regarding the public concern to prevent the proliferation of hazardous waste and its improper disposal. However, management of waste are still not well promoted. So, to intercept the build-up of biohazards into the environment, waste from biohazardous operations must be disposed or treated appropriately in a special way and it also intends to create awareness amongst the personnel involved in these sectors to develop and implement hazardous waste management and mitigation strategies.

INTRODUCTION

Over the past two decades, hazardous waste has become a serious issue of concern in many countries including India. Hazardous waste has negative impact on human kind and the surrounding due to mismanagement during storage, transportation and disposal. It inholds biological agents (bacteria, viruses,
Impact of Hazardous Waste Material on Environment and Their Management Strategies

prions, fungi, protozoans, tissue cultures, toxins, recombinant DNA (rDNA), transgenic animals, body fluid and tissue etc) as well as chemicals (potentially toxic) used in daily routine in research and educational institutes, industries (e.g., carcinogenic, mutagenic and teratogenic) and in household that may confer danger to the living beings if discharged in the umbworld. Hazardous waste not only contaminates the environment but also perilous for human beings, animals and plants by another means. Hazardous waste can be classified on the basis of physical, chemical and infectious properties of the waste and their risk of injury during its handling and disposal. People working in laboratories and medical centers are at particular risk of exposure to hazardous agents. There is growing observations that many professions including agriculture, textiles, woodwork, sewage and compost plants harbour the potential for various forms of hazardous waste. Every day millions of tons of waste are being produced by indefinite numbers of hospitals and other medical and research institutions of our country. Furthermore people involved in storage, transport, treatment and disposal of these waste are also susceptible and at high risk. Besides this, a huge amount of health care wastes such as saline bottles, disposable syringes, I.V. fluid bottles etc. are picked up by rag pickers all over the country and recycled back into the market without any sterilization or disinfection. These wastes harm the surrounding even at low concentration and its management all over the world is still in its infancy. So it becomes mandatory to take preventive steps for the proper treatment and safe disposal of the waste, to raise awareness for constant watchfulness and to provide some counseling or guidance towards the handling of hazardous waste existing in the environment.

- **Sources of Hazardous Material:** Although city solid waste has allured the concern of environmentalists and social administrators, but still there is lack of attention for certain sources of waste and its proper management. One such waste is biohazardous waste. According to the US Center for Disease Control and Prevention (Gangadharan, Smith, & Weyant, 2009) “any microorganism, cell culture, or human endoparasite, including genetically modified organisms, which may cause infection, allergy toxicity or create a hazard to human health are biohazards.” A huge amount of hazardous material is churn out from the hospitals, nurshing homes, veterinary hospitals, animal houses, blood banks, research institutes and related laboratories (Dutkiewicz, Jablonski, & Olenchock, 1988). Other sources which are associated with biohazards are industries, household and education institutes can badly hit human welfare. United Nation categorized hazardous waste as unsafe goods for shipment that comprises medical waste and all the substances transferable to humans and animals. So from the obtainable proofs it can be concluded that hazardous agents may survive in almost any profession. Human may be affected by biohazards, either by contact with animals through transmission of zoonotic agents (e.g. brucellosis) or by direct contact of causative agent (e.g. a bite from a venomous snake). Some can transfer directly or indirectly (e.g. toxoplasmosis). Some diseases like leishmaniasis (protozoan parasite is transmitted by the bite of phlebotomine sandflies), dengu (virus is transmitted by Aedes spp. mosquitoes) and malaria (protozoan parasite is transmitted by Anopheles spp. through mosquito bites) by intermediate host vector or insects as they require human host to complete their life cycle and the diseases (e.g. leishmaniasis, malaria and dengu) that may spread through organ donation and infected blood is known as anthroponoses . Various other infective agents associated with disease transfer are summarized in Table 1.

- **Types of Hazardous Material:** Many organizations are associated with hazardous waste production but the most prominently involved organizations are health care establishments, industries, educational and research centers and their related laboratories. Based on their concentration,
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