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STUDY ON WASTE MANAGEMENT IN PHARMACEUTICAL COMPANIES

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ABSTRACT

Indiscriminate dumping of wastes contaminates surface and ground water supplies. In urban areas, solid waste clogs drains, creating stagnant water for insect breeding and floods during rainy seasons. Uncontrolled burning of wastes and improper incineration contributes significantly to urban air pollution. This study sought to assess waste management of pharmaceutical companies through descriptive ways. The results of this study indicate that factories separation processes, transportation and temporary storage of waste within the plant was higher than the average of the Ministry of Health. Waste Management evaluation of companies indicated that in pharmaceutical companies waste Management processes are relatively in good condition.

Key Words:- Management, Waste, Checklist, Pharmacy, Tehran.

INTRODUCTION

In everyday humans life, several waste is generated which can be divided into two general categories of solid waste and wastewater. In this division, any solid, liquid and gas material (apart from sewage) that is derived directly or indirectly from human activities and is considered redundant for the manufacturer is in the waste group and the produced wastewater is placed in the category of wastewater.

Determining the waste and wastewater from pharmaceutical industries is practically difficult and almost impossible because of the diversity of the products and the industry development. The objective of waste management in the pharmaceutical industry is incineration or recovery in order to reuse and make the waste non-hazardous for discharge to the receiving environment. In this regard, we have first evaluated the waste management legislation and after that reviewed the waste management

in pharmaceutical companies using the World Health Organization and the Ministry of Health of Iran in order to have proper strategy for optimal management (Oller I *et al.*, 2011).

Types of waste

- Ordinary waste: contains all the wastes that are typically produced from the daily activities of people in towns and villages, and out of them Such as house hold waste and construction debris.
- Medical waste (hospital): All infectious and hazardous waste from all hospitals, health centers, clinical laboratories and similar facilities are called medical waste. Other hazardous hospital wastes are outside the scope of this definition.
- Special wastes (hazardous): is referred to all the wastes that due to the high level of at least one hazardous property such as toxicity, pathogenicity, being explosive or flammable, corrosive and the similar, special care is needed. Some of medical wastes as well as part of normal, industrial, agricultural wastes that require special

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management are part of special waste. Chemical pharmaceutical waste in the classification of the waste are classified as medical and special wastes.

- Agricultural waste: is said to the waste resulting from production activities in the agricultural sector Such as waste animal carcasses (livestock, poultry and fish) spoiled or inedible crops.

Industrial waste: is related to all wastes from the industrial and mining activities an refinery, gas, oil and petrochemical, power generation, etc. such as filings, the spill over sand industrial sludge.

Solid Waste Management

waste management (solid waste) consists of a set of coherent and systematic rules regarding the control of production, storage, collection, transportation, processing and disposal of solid waste according to the best principles of public health, economics, conservation, aesthetic, other environmental requirements and the public interest contains complicated interrelationships among disciplines such as political science, urban and regional planning, economics, geography, sociology, communications, statistics, and health, environment and engineering so it contains the six elements required to produce, transport, processing and storage and collection, transportation, processing, recycling and disposal (Abdel-Raouf N *et al.*, 2002).

The waste management hierarchy can be categorized as follows:

- Avoid the production of waste
- Reduce Waste
- Reuse of waste
- recycling and recovery of materials and energy
- and finally landfill (Zhuo Chen *et al.*, 2012)

Non-observance of environmental issues can create health hazards and is a threat to public health. On the other hand studying wastes and identifying them help strategies for reuse of this material and provides them the benefit of their economic advantage. The following are some of the most important objectives of the Waste Management Study.

- Protection of soil and water resources from the negative impacts of waste mismanagement
- Reducing pressure on the environment, public health and health promotion
- Create conditions for the development of new technologies aimed to avoid waste production
- Definition and deployment lifecycle of waste

Drug Industry

In spite of the wide variety of processes, products and raw materials, pharmaceutical industries are classified

into the following categories that in terms of process, problems with waste discharge and disposal methods and refined have similarities (Klemeš J and Perry SJ, 2007). Based on pharmaceutical manufacturing processes, pharmaceutical industries are divided into five main groups that one plant may function in each of the following areas specifically or the combination of multi-unit:

- Fermentation industrial plants
- chemically synthesized organic material industrial plants
- chemically synthesized organic / fermentation material industrial plants production of biological drugs industrial plants
- Preparation, pharmaceutical compositions and formulations industrial plants (Tablets, capsules, oral solutions)

METHODOLOGY

This study aimed to describe and evaluate the accuracy of the waste management in the pharmaceutical industry in 18 public and private companies in the Tehran city. In this study a checklist containing 30 questions was used as data collection tool. The checklist in the form of an option package was designed in the public and private sectors. Public section of checklist includes general information but the specific section of the checklist consists of four distinct parts including segregation, collection, transportation, storage, temporary storage and final disposal of wastes. 25 points is considered as each part share of the checklist that due to the standard of the Ministry of Health, each factory must have at least 50 points from every part of the plant's processes separately to obtain acceptable health. The final score of the total sections of the checklist is at least 50 points so that the company is acceptable (from health point of view).

RESULTS

"T-Test" statistical test to delineate the relationship between segregation indexes with the total number of workers in the collection, transportation and disposal of factory waste over the entire factory staff showed that the increase of this index segregation of wastes is desirable which was statistically ($t_2=0.46$, $p<0.05$) significant.

"T-Test" statistical test to delineate the relationship between segregation indexes with the total number of workers in the collection, transportation and disposal of factory waste over the entire factory staff according to government and private industry showed that this value was not significantly ($t_2=0.46$, $p<0.05$) different between public and private company. Factory evaluation criteria are stated in Tables 1 and 2.

Table 1. Percentage of optimal waste management processes according to the factory ownership

| Private Company | State Plant | Type of process |
|-----------------|-------------|------------------------------------|
| 100 | 78.6 | Segregation Status |
| 42.9 | 57.1 | Collection & transportation Status |
| 71.4 | 42.9 | Storage & temporary maintenance |
| 50 | 42.85 | Waste disposal status |

Table 2. Percentage of optimal waste management processes according to type of activity

| Private Company | State Plant | Type of process |
|-----------------|-------------|------------------------------------|
| 91.8 | 60 | Segregation Status |
| 41.8 | 80 | Collection & transportation Status |
| 56.1 | 40 | Storage & temporary maintenance |
| 56.25 | 80 | Waste disposal status |

CONCLUSIONS

Using advanced methods of waste management not only can reduce the consequences of waste and industrial wastes but also the other production costs. An efficient and effective system of solid waste management plans to manage the wastes in a way that protecting the environment and human health are best possible. The results of this study showed that waste management process in pharmaceutical companies in Tehran respectively in separation processes, transport process and temporary storage within the plant with an average of 89%, 71% and 72% and the process of final disposal of waste outside the factory, with an average of 57 percent were higher than average health ministry. The results also showed that the disinfection of waste bins and vehicles daily in the processes of collection and transportation of waste within the factory is on average applied only in 24 percent of the plant that because of the risk of spreading infectious agents in the environment, were not acceptable by health ministry standards. Evaluating of the temporary storage of waste in pharmaceutical companies indicated that except for installation of warning signs on the temporary storage place of waste with an average of 29 percent other processes were are acceptable and desirable for the Department of Health. Waste management processes in pharmaceutical manufacturing companies in

Tehran is in a fairly good condition, but not using specialists in all factories, Lack of staff awareness of waste management in the pharmaceutical industry, not use of advanced equipment and negligence in full compliance with the standards made risks associated with the pharmaceutical industry wastes threaten the environment and human.

SUGGESTIONS

- Create an orderly and efficient system for the management of waste in factories
- Waste Study Committee with the participation of experts and specialists
- Using software product lines to reduce waste while production
- Separation and segregation of waste at source
- Waste management training courses for personnel to make them familiar with the waste issues
- Special attention to national resources and the environment
- Encourage and motivate the private sector to invest in waste management

Planning for Waste Management industry association responsible for transferring good practices.

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