

# STUDY ON DISPOSAL AND TREATMENT OF PHARMACEUTICAL WASTES

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**Abstract:** In this paper, the recent developments seen in the treatment of certain pharmaceutical wastes and their means of disposal. Increasing environmental pollution coupled with increasing amount of uncontrollable pharmaceutical waste entering the eco-system has urged us to choose this topic where we focus on how pharmaceutical waste can be handled, generated, disposed and how new strategies can be reinforced step by step. Till date, researchers have acknowledged many human and veterinary pharmaceutical compounds at serious concentrations in drinking water resources and they are a major contributor to environmental pollution. As responsible citizens and waste managers, we need to keep in the precautionary principle in mind. Disposal of pharmaceutical and other chemical wastes such as lab waste can be highly problematic where there are no established treatment facilities.

## Introduction

Wastes are the unwanted or unusable materials that people will no longer use for, which are either intended to get rid of or have already been discarded. Moreover, wastes can be hazardous to human or the environment as such which has to be discarded immediately, else to another useful product. The chemical pollution of water resources is a major challenge. Pharmaceutical and medication products come under this threat. They refer to products used in order to enhance growth or health of a person or livestock. They also include prescription drugs, therapeutic drugs, cosmetics, etc. In this paper we shall study the history, referring to various previous disposal practices of such wastes and come up with suitable newer methods which are more efficient and their successors.

## Pharmaceutical wastes and literature

Pharmaceutical waste includes expired, unused, split and contaminated pharmaceutical products, drugs, vaccines and sera that are no longer required and need to be disposed of appropriately. The category also includes discarded items used in the handling of pharmaceuticals, such as bottles or boxes with residues, gloves, masks, connecting tubes and drug vials. Ideally, pharmaceuticals are discarded and treated by high temperature (i.e. above 1200 degree Celsius) incineration. (Kadam et al. 2016)

After intake, pharmaceuticals are excreted with urine or faeces to raw sewage in both an unchanged form of metabolites. This raises the question of what impact pharmaceutical residues have in the environment, which in turn requires relevant data on exposure and effects on aquatic living organisms.

A set of guidelines by the World Health Organization on proper and safe disposal of medical and pharmaceutical wastes is taken as the backbone for this review paper. These guidelines are followed throughout the world. The paper also sheds light on the effects of improper and unscientific disposal methods which are harmful for the environment. (Societies and Federation 2000)

With the help of quantum photodegradation techniques, STP effluents from four European countries (France, Italy, Greece and Sweden) with no previous record of pollutants of pharma wastes were analysed for the presence of such waste. The detailed results show signs of chemicals and their residues which constitutes to presence of pharmaceutical wastes. (Andreozzi et al. 2003)

This particular paper aims to define the principles which must be considered while removing and disposing of pharmaceuticals that are no longer required. Different types of pharmaceutical wastes such as: hazardous, non-hazardous and biomedical wastes are studied and their properties are listed. (Safe 2013)

Pharmaceutical waste is not one single waste stream, but many distinctive waste streams that can affect the integrity and uniformity of the chemicals that involve pharmaceuticals. An overview on biomedical waste which mainly consists of solid and liquid waste that is engendered in the diagnosis and treatment of human beings and animals is studied. The steps taken by industries that manufacture drugs and medicines are checked and the immoral practise of waste dumping is brought to notice. (Sreekanth et al. 2014)

Till date, researchers have acknowledged many human and veterinary pharmaceutical compounds at serious concentrations in drinking water resources and they are a major contributor to environmental pollution. Emphasis is also

given on pharmacist role in proper disposal of unwanted and expired medicine makes a significant impact on the environment as well as it prevents accident, poisoning and intentional violence. So it will lead to the welfare of society and trudge towards goal of 2020 health for all. (Kadam et al. 2016)

The results of this investigation, supported by a similar work in the literature, indicate that many drugs (including their metabolites and transformation products) are not efficiently eliminated during the wastewater treatment processes (sometimes tertiary treatment, as in this study). This may suggest that conventional wastewater treatment technologies are inefficient in completely removing such compounds and as a consequence leaving the way open for such bioactive compounds to enter the aquatic environment and eventually pollute the drinking water supplies and pose health risks to humans and other living organisms. (Shraim et al. 2017)

Wastes are the unwanted or unusable materials that people will no longer use for, which are either intended to get rid of or have already been discarded. Pharmaceutical waste management is a challenge to the medical personnel who works in the recycling industries, government administrations, policy planning's, quality assurance, etc., for the effective waste management. New classification for medical wastes for their easy removal and effective technique have to be developed in a continuous manner and it has to be ensured that these can decrease the cost of the waste management. For the reduction of waste materials, the authorities must implement different techniques and strategies. (Jaseem et al. 2018)

Various disposal methods by a variety of individuals starting from the manufacturer and up to the consumer and to students, we see many unorthodox and harmful means. Hazardous pharmaceutical waste is a growing concern for all types of healthcare facilities, including pharmacies, hospitals, and clinics. It isn't limited to expired pharmaceuticals, either; vials and bags containing trace quantities of toxic substances, protective gear, spilled liquids and pills, and even packaging can be classified as pharmaceutical waste. As the global health care system expands, reaching more people and offering ever more sophisticated treatments, a silent and largely neglected crisis is unfolding. (Dar et al. 2019)

This paper is a review of the good and bad, the advantages and disadvantages of pharmaceuticals. From landfill dumping to incineration, different methods are studied and tests are conducted before and after treatment and the best suitable method is adopted. We can see presence of traces of different toxic elements not only prior to their treatment but also soon after. Thus we conclude that the previous practises and methods of disposal aren't eco-friendly and they need to be checked so that new and healthier methods are endorsed. (Somwanshi 2020)

In this study, analysis of 27 pharmaceuticals in liquid and solid phase samples were collected from unit process of four different STPs to evaluate their distribution and behaviour. The test results showed huge traces of toxic substances indicating the release of pharmaceutical wastes into STPs which is an indecent practise as these wastes are to be released into ETPs or incinerated. This paper unfolds the unethical practices of small scale pharmaceutical plants and their irregular waste disposal methods. (Park et al. 2020)

## Conclusions

This paper has reviewed several journals which are listed below and shall further carry on our work in conducting trials and experiments on available medical and pharmaceutical wastes before and after disposal. This helps us to determine the extent of the treatment and its quality, thus making way to adapting newer and improved techniques. The following steps shall be taken before implementing such techniques.

1. The waste sample shall be collected from a designated treatment and manufacturing plant.
2. Trials shall be carried out under the supervision of skilled personnel.

The outcome of these trials may lead to:

1. Improvement in treatment process.
2. Discovery of new methods if possible.
3. Patent opportunities.

Thus, through this research, we would be helping the society in becoming a waste free environment.

## Research needs

In this scenario, we need the aid and support of a pharmaceutical manufacturing unit, a treatment facility and frequent industrial visits. Updating ourselves in this field also plays a vital role as newer techniques might bloom at any time.

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