

CHAPTER 1

INTRODUCTION

1.1 Introduction to pharmaceutical industries: ^[1, 2]

Environment contamination has become a key concern due to contaminants discharged onto environment through different sources. Tremendous increase in world's population as well as upcoming industries has respectively raised the demand for earth's limited supply of freshwater. Hence, protecting the marine environment and addressing concerns such as toxicity and the existence of lethal elements that may have adverse effects on human, flora and fauna has become an key issue.

Now a day's the increase in industries like pharmaceutical industry, textile industry etc has correspondingly increased the waste generation. The waste disposal from these industries can cause serious effects on environment. Medicinal industry is an chief constituent of health care systems all through the globe, it comprise community and private organisations that discover, produce and market medicines for human being and animal wellbeing. These industries utilize biological, chemical agents and also industrial chemicals for research and developing active medicinal products. More often these industries result in generation of solid waste, liquid waste including acids , metal fluid waste, discharge from pumps, leaks spills etc, that are toxic to marine environment. Due to various processes involved in this industry the quantity of waste generated is more and may also contain organic and inorganic substances with different chemical concentrations, toxicities etc.

As per the study in past years, medicinal and other care products are considered as emerging pollutants due to their widespread use in human and animal wellbeing and their increasing occurrence in marine environment. The worldwide market for pharmaceuticals is estimated between 1, 00,000-2, 00,000 tons/year.

1.2 Compounds of emerging concern: ^[1, 2, 3]

In the surroundings there are a few possible fate for any drug such as,

1. May be recyclable and thus become mineralised into CO₂ and water.
2. May go through metabolic process or may be incompletely degraded.
3. May be persistent.

Medicinal products have been identified at trace concentrations that can cause various environmental impacts on marine life. These drugs along with emerging contaminants

like metals etc are referred as compounds of emerging concern. The other pharmaceutical compounds like fluoroquinolones are not easily degradable at treatment plants. Fluoroquinolones are antibiotics which are generally used in treating human beings and animals. These antibiotics make a way to the environment from different sources like leakage from septic tanks or landfill sites, wastewater treatment plant effluents, direct disposal from residence, hospitals, farming etc. Animal medicinal products can leach into groundwater from livestock run off and human pharmaceuticals can enter into the water bodies from intake followed by excretion in form of metabolites. Fluoroquinolones are found to be in various concentrations in both sewage treatment plant and industrial effluent treatments plants. So this it leads to serious effects on environment such as contamination of water bodies, groundwater contamination, bacteria developing resistance to these pharmaceutical agents, etc and thus affecting human beings, flora and fauna.

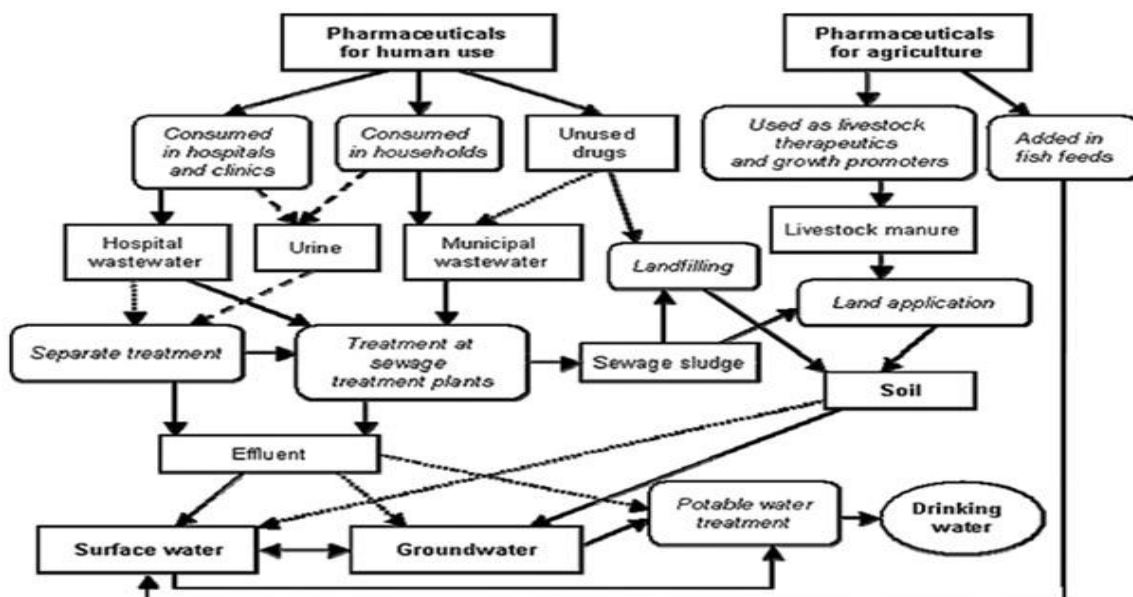


Figure 1.1: Different pathways of pharmaceutical compounds

Thus, with the concern of effects caused by medicinal products there are many techniques reported in the literature to treat these medicine molecules in wastewater viz. chlorination^[4], reverse osmosis^[5], nanofiltration^[5], ozonation^[6] etc, but these methods represents certain disadvantages. The drawbacks are in terms of economy, high power necessity etc. Therefore the use of adsorption technique holds good compared to other techniques because of its benefits such as low cost, efficient in decontamination, flexible and easy in process etc^[9].