Chapter 5
Pesticide and Human Health:
A Rising Concern of the 21st Century

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ABSTRACT

Pesticides are known to be one of the extremely useful and incredibly beneficial agents for preventing losses of crops as well as diseases in humans. They are used in a large number of conditions as in farms, orchards, gardens, parks, sports lawn, residences, industrial areas, shops, schools, hospitals, airports, railway lines, drains, on animals, and on people for control of diseases such as scabies and head lice. People are exposed to pesticides in their daily lives through multiple routes of exposure such as occupational or food, water, and air. Many pesticides can be used safely and effectively, but care must be taken while using them. Several pesticides are beneficial in agriculture for killing pests. Yet many times their injurious effects offset the positive ones. Uses of pesticides are apprehension for sustainability of environment and global stability. This chapter aims to discuss pesticides, their types, routes of their exposure, human health concerns related to them, methods to stop using them, and a future scenario of the world after eradicating pesticides.

INTRODUCTION

Pesticide is a substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest. Agricultural pesticides are those chemicals that are used by farmers to prevent the loss of growth and productivity of crops from pests. They have numerous beneficial effects including crop protection, preservation of food and materials and prevention of vector-borne diseases. For example pesticides may be used in the prevention of malaria, which kills up to 1 million children per year, and

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for preventing other vector-borne diseases such as dengue, leishmaniasis and Japanese encephalitis. Pesticides are designed to kill the pest and they target systems or enzymes in the pests which may be identical or very similar to the systems or enzymes in human beings. The major drawback of pesticide is that their mode of action is not specific to one species; they often kill or harm organisms other than pests, including humans. Therefore, they pose risks to human health. The World Health Organization estimates that there are 3,000,000 cases of pesticide poisoning each year and up to 220,000 deaths, primarily in developing countries (Lah, 2011).

Pesticides are an important tool in modern agriculture, but the risks and benefits of using pesticides must be considered before an application takes place. Insects and pests are getting immune to the commercial pesticides due to over usage. Now a day's pesticides have been developed which target multiple species (Speck-Planche et al., 2012). Chemical pesticides and insecticides are becoming a dominant agent for eliminating pests. When these chemical pesticides are used in a combination of effective natural enemy then they result in enhanced integrated pest management and act as a comprehensive prophylactic and remedial treatment (Gentz et al., 2010).

Although pesticides are developed under very strict regulation processes to function with reasonable certainty and minimal impact on human health and the environment, serious concerns have been raised about health risks resulting from occupational exposure and from residues in food and drinking water. Pesticides have also posed a serious threat on biological integrity of marine and aquatic ecosystems. Non-regulated use of pesticides has led the environment into disastrous consequences. Serious concerns about human health and biodiversity are on rise due to overuse of pesticides (Agrawal et al., 2010). Pesticides are considered to be more water soluble, heat stable and polar which makes it very difficult to reduce their lethal nature. Pesticides are not only toxic to people related to agriculture, but they also cause toxicity to other people. Depending upon the target species, pesticides can cause toxicity in natural flora, natural fauna and aquatic life (Rashid et al., 2010).

Water pollution is on the rise due to these pesticides, even at low concentration, these pesticides have serious threat to the environment (Agrawal et al., 2010). There are organochlorines, which are used as pesticides. These pesticides are least biodegradable and their use is banned in many countries. Besides this fact, organochlorines are highly used in many places. This results in serious health hazards. The majority of farmers are unaware of the potential toxicities of pesticides. They have no information about types of pesticides, their level of poisoning, hazards and safety measures to be taken before use of those pesticides. Due to this reason, toxic and environmentally persistent chemicals are used to kill pests which can also lead to intentional, incidental or occupational exposure. These compounds have long term effects on human health. Awareness should be given for these farmers to reduce the use of toxic pesticides (Sharma et al., 2012).

ANCIENT TO CURRENT SCENARIO OF PESTICIDES

In Ancient times Romans started using burn sulphur for killing pests and salts, ashes and bitters for controlling weeds. Then a Roman naturalist advised to use arsenic for management of insects (History of pesticide use, 1998). In 1600s, mixture of honey and arsenic was used for controlling ants. There after the farmers in the USA started using certain chemicals such as sulphur, nicotine sulphate and calcium arsenate for field application in 1800s (Delaplane, 2000). The major breakthrough in pesticide development occurred in the period around and after World War-II, when several efficient and economical