

FORENSIC SCIENCE INSIGHTS

Gossman Forensics – Louise Denlinger, David Gossman

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Pesticide Exposure

Introduction

Pesticides are substances used to destroy unwanted pests such as insects, rodents, weeds, germs and mold. People regularly use pesticides in the form of topical applications to prevent mosquito and tick bites and to treat for lice infestations. Used in agriculture, pesticides can help farmers increase yields and improve the quality of their crops and/or livestock. There has been a steady growth in the use of pesticides for these reasons. While the development of pesticides has been regulated to help minimize adverse health and environmental effects, improper use and/or accidental exposure can have negative consequences.

Types of Exposure

Pesticides are able to enter the body through any or all of the three routes of exposure: inhalation exposure (breathing), oral exposure (through the mouth), and dermal exposure (skin or eye contact). The toxicity of the substance will determine its ability to harm a living system and/or cause environmental or economic damage. The effects of exposure may be from a single exposure or may span a long period of time. Acute toxicity refers to the pesticide's ability to cause harm from a single exposure. Chronic toxicity and effects from exposure occur when repeated exposure occurs over a long period of time. The hazard or risk associated with a pesticide depends on the toxicity levels, route and amount of exposure.

Drift

Pesticide drift is the airborne movement of pesticides from a target area of application to any unintended site. There are essentially two types of drift: particle drift (off-target movement during application) and vapor drift (off-target movement when a pesticide evaporates from a sprayed surface). Drift can occur during pesticide application and/or when droplets or dust travel away from the intended target site. Pesticides can become airborne, that is, attached to wind-blown dust and transported. According to the National Research Council, crop dusting and other types of aerial applications of pesticides lose up to 40% of the pesticide load to pesticide drift.¹ It can also happen after the application, when some chemicals become vapors that can move off-site.

A 2001 study by Texas A&M University concluded that some pesticides can volatilize into the gaseous state and be transported over long distances fairly rapidly through wind and rain.² Any application resulting in an involuntary exposure of pesticides is considered to be chemical trespassing. It is the applicator's responsibility to consider all the factors that will impact drift of a specific pesticide application. Applicators should identify sites near the application area that are at risk from exposure to pesticides. These may include, for example, sensitive crops, organic fields, bee-hives, bodies of water and shallow groundwater, schools, nearby residences, hospitals and nursing homes.

Effects from Drift

Health effects from pesticide drift can vary depending on the type of chemical, amount, and type and length of exposure. In general, nausea, dizziness, respiratory problems, headaches, rashes, and mental disorientation may occur. Pesticide exposure can also adversely affect the neurological, respiratory, immune, and endocrine systems, even at low levels. Children, the elderly and at-risk individuals may experience more severe reactions. People living, working, playing and attending school near large agricultural properties may be subjected to some type of pesticide drift on a regular basis.

In addition to health effects, drift can cause property and economic losses. Drift of herbicides can injure some crops. Crops on nearby farms can be destroyed or become not saleable if the drifting pesticide is not registered for use on the crop. Crops certified as organic will also suffer negative consequences from drift. Livestock can suffer from exposure to pesticide drift and/or ingest silage and pasture grasses that have been contaminated. In some cases, drinking water may be affected by drift.

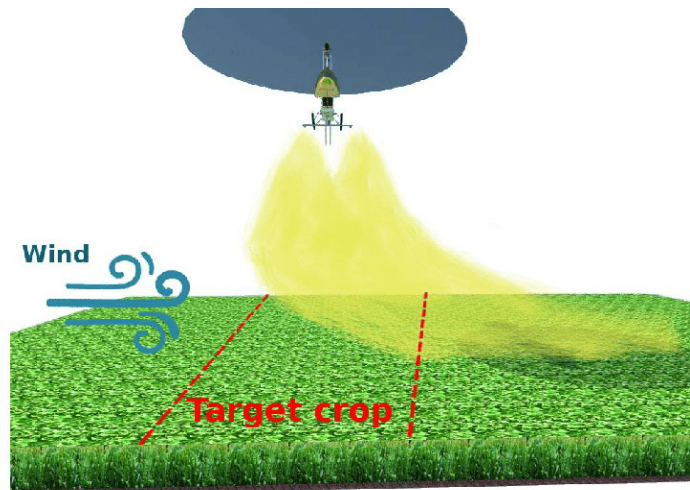


Image depicting wind effects on pesticide drift.³

Conclusion

Many pesticide laws focus on spray drift that causes harm, or has the potential to do so and vary in each state. Individuals that are applying pesticides have the primary responsibility for drift management. They must take all reasonable precautions to prevent harmful drift. Spray drift can be illegal if the applicator did not follow the instructions on the label or other requirements, or if the drift causes harm to humans and property, or has the potential to do so. Pesticide drift is a serious issue that can have real, significant, and far-reaching impacts on agricultural workers, property, humans, animals and crops. It is important to retain an expert that has significant experience and education in chemistry and drift modeling. The team at Gossman Forensics can identify the source of the issue and assist in litigation.

¹ National Research Council. 1993. Soil and Water Quality: An agenda for agriculture. Board on Agriculture, Committee on Long-Range Soil and Water.

² Wade, T., et al. 2001. Atmospheric Deposition of PAH, PCB and Organochlorine Pesticides to Corpus Christi Bay. Texas A&M Geochemical and Environmental Research Group. Presented at the National Atmospheric Deposition Program Committee Meeting.

³ Image, Faical, Bruno & Freitas, Heitor & Gomes, Pedro & Mano, Leandro & Pessin, Gustavo & de Carvalho, Andre & Krishnamachari, Bhaskar & Ueyama, J6. (2017). An adaptive approach for UAV-based pesticide spraying in dynamic environments. Computers and Electronics in Agriculture. 138. 210-223. 10.1016/j.compag.2017.04.011.