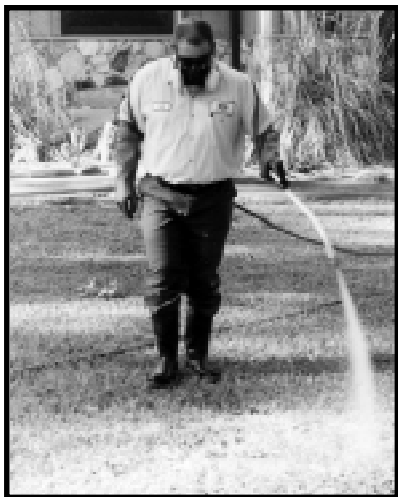


Chapter 2

Pesticide Contamination of Soil, Vegetation, Turf, and the Outdoor Environment

Outdoors, pesticide residues may persist in soil, and on vegetation and turf. These residues may also be “dislodged” onto human skin, shoes or clothing.

- Many herbicides applied to school grounds may leave **persistent residues** in soil for weeks, months, or even years. See Table 2-1 for information about the **half lives** (time until half of an applied substance has degraded or moved away from a site) and **persistence** (time until all measurable residues of a substance are gone) of some herbicides commonly used on school grounds.
- One study found that 1.5 - 4% of **residues of the insecticide chlorpyrifos** deposited on a lawn were “**dislodgeable**” or in other words, could come off the treated lawn onto shoes, skin, or clothing (Black and Fenske, 1996).
- Another study found that up to 0.2 percent of the residues of two different herbicides applied to a lawn were “**dislodgeable.**” Notably, the amount of residue that was dislodgeable actually **increased between 4 and 8 hours** after the application, as the pesticide spray dried (Nishioka, 1996).



Vapors and residues of pesticides applied outdoors may also drift or volatilize off the treatment site, contaminating air, soil and vegetation (and increasing the potential for human exposure).

- **Volatilization** was the likely cause of exposure and illness of many school staff the day following the application of multiple pesticides to fields at their California school (see Appendix A, California incident #30).
- **Volatilization** was also the cause of exposure and illness at an Ohio school the day following a pesticide application made to a shed near the school building (see Appendix A, Other states incident #18).
- In an incident at a Washington school, fumes **volatilizing** from two commonly-used granular herbicides being applied to school shrub beds entered classrooms via air intakes and sickened a teacher (see Appendix A, Washington incident #6).
- **Drift** of pesticides being applied to school grounds or adjacent properties accounted for numerous of the exposure incidents listed in Appendix A, including California incidents #8, 35; Idaho #5, 6; Washington #2; Other States #26, and others. **High air levels** of the toxic pesticide methyl bromide were found near one California school ground in testing done following fumigation of an adjacent agricultural field. The chemical had **volatilized or drifted** from the site of application (see Appendix A, California incident #6).

Table 2-1. Half-Life* and Persistence* in Soil of Active Ingredients of Some Common Weed-Killers

***Note:** Half-life is the length of time it takes for half of an applied substances to degrade or move away. Persistence is the length of time until all measurable residues of a substance are gone. Half-life and persistence outdoors can vary considerably depending on conditions (temperature, humidity, soil type, wind, rain, sunlight, etc.). Also, in many cases, the values listed below are simply the last times for which samples were analyzed in a given test. Actual persistence may be much longer.

| Pesticide | Product Names | Half-life | Persistence | Other |
|------------------|----------------------------------|---|--|---|
| glyphosate | Roundup | 3 - 141 days (US EPA, 1993-1) | Varies widely: 55 days - 3 years (Newton, 1984; Torstensson, 1989)) | Initial degradation is faster than subsequent degradation of what remains (Torstensson, 1979). US EPA states that glyphosate is "extremely persistent under typical application conditions" (US EPA, 1993-2). |
| dichlobenil | Casoron Norosac Barrier | Varies widely: 16 - 241 days (US EPA, 1998-1) | > 5 years (Williams and Eagle, 1979) | Highly volatile (Howard, 1991). Residues sufficient to damage crops have been found 2-5 years after soil application (Williams and Eagle, 1979). One study found that 42-57% of dichlobenil remained 105 days (3-1/2 months) after treatment to soils (Richards, 1968). |
| clopyralid | Confront Transline Stinger | up to 11 months (US EPA, 1992) | 2 - 14 months (Pik, 1977; Bovey, 1991) | Considered "persistent" (US EPA, 1992) and "volatile" (US EPA, 1990-2). |
| triclopyr | Confront Garlon | 75 - 81 days (Norris, 1987) 2 - 8 weeks (US EPA, 1998-2) | Varies widely: 1 month - 2 years (Nilsson, 1983; Stark, 1983) | The primary breakdown product (degradate) of triclopyr is 3,5,6-TCP. This chemical is comparable in toxicity to triclopyr itself, and has been found in triclopyr-treated soil for more than 63 weeks (US EPA, 1998-2). |
| oryzalin | Surflan | > 60 days (US EPA, 1994) | > 3 years (US EPA, 1994) | EPA states: "Chronic post-application exposure from residential lawn applications is of concern because oryzalin is a possible human carcinogen and persistent. There is a potential for continued, substantial contact with treated surfaces, particularly among children. There are no data to evaluate potential exposure to turfgrass and therefore the safety of this use cannot be evaluated" (US EPA, 1994). |

- One study showed that for many pesticides, **volatilization** was the **primary mode of dissipation** from treated soil. That is, more of the pesticide ended up in air than was broken down in the soil (Glottelty and Schomberg, 1989).
- Another study showed that herbicides continued to volatilize from plants **up to 9 days** following treatment (Straathof, 1986). **Many of the herbicides** volatilized from plants in **doses sufficient to cause moderate or severe damage to nearby vegetation** (Que, 1975).

Pesticide-containing baits, pellets, or granules, used indoors or out, can be attractive hazards. They can last for months, and may be inadvertently touched or eaten.

- To attract and kill rodents, some school districts place poisonous baits indoors or on school grounds. Rodent baits are sometimes **applied as pellets in unopened paper or plastic bags**, or in **paraffinized blocks** in bait stations. Insecticide **baits** are also commonly used indoors and out, and **granules** of weed-killer or insecticide are applied to school shrub beds, along fencelines, or around the base of trees. Some schools spread **poison-laced grain** on turf or roofs to attract and poison pigeons or other birds (NCAP, 1998-1; NCAP, 1998-2).
- Pesticide baits, pellets, or granules may last for many months indoors or out. Pellets and baits, or the containers or packages they may be in, can be attractants for curious children who may discover and touch or taste them. Chapter 3 discusses how children can and have ingested pesticide granules and baits, including actual or near-exposure incidents in school settings.

