Unthinkable Risk

How Children Are Exposed and Harmed When Pesticides Are Used at School

April 2000

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Summary and Introduction

Intentional Poisons in Our Schools

Pesticides are poisons intended to kill unwanted living organisms such as weed or insect "pests." A growing body of scientific and medical evidence suggests that children are especially vulnerable to the harmful effects of some pesticides, including those that are nerve poisons, carcinogens, reproductive toxins or hormone disruptors. Despite this, these toxic chemicals remain in widespread use in and around schools.

It is a common belief that pesticides break down rapidly in the environment and therefore children are unlikely to be exposed even a short time after application. But parents and school officials would be wise to examine the evidence for themselves.

The reality is that nearly anywhere pesticides are used, unavoidable contamination occurs. Pesticide residues can be surprisingly persistent in both indoor and outdoor environments. When pesticides are used in a school or on a school ground, children and other school occupants face unavoidable exposures. Children are likely to experience higher exposures than adults to many of these pesticides. Because of their size and immaturity, they also face the greatest health risks from their exposures.

Persistence in soil of some weed-killing pesticides commonly used by schools

(See Table 2-1 for citations)

Pesticides Pollute Classrooms and School Grounds

There have been few studies of pesticide contamination in school environments. However, Chapters 1 and 2 review the strong evidence that when pesticides are used indoors or out in other comparable settings, unavoidable contamination occurs, even when products are used according to label directions. Consider the following:

- Pesticide and solvent vapors can persist in indoor air for many hours following treatment, even when applied according to label directions, and even when rooms are ventilated. Even pesticides applied beneath a building can result in measurable levels of pesticides in indoor air for weeks or even years.

- Residues of many pesticides are rapidly deposited on indoor surfaces, where they can remain for days, weeks, or even months. Many methods of application can leave residues on surfaces throughout a room. Plush carpets, upholstered furniture, or pillows can also absorb pesticides, and later release vapors back into the air. Pesticide residues also accumulate in house dust.

- Pesticides can move from the site of application. Air currents or forced air can carry pesticide vapors and residues around a room, from one area of a school to another, or even into classrooms from outdoors. Residues can also be tracked indoors from lawn applications.

- Outdoors, pesticide residues may persist in soil, and on turf and vegetation for extended periods. Dried residues of liquid sprays can volatilize back into the air. Vapors and residues of pesticides applied outdoors may also drift off the treatment site, contaminating non-target soil and vegetation.

- Pesticide baits or granules, used indoors or out, can last for months and can be an attractive hazard.

Children Are Unavoidably Exposed

There is growing concern among scientists and government agencies about the exposure of children to pesticides in our food supply and drinking water. How do the exposures that children (and others) face from pesticide use in their immediate environment, such as at home, schools, or local parks, compare? A 1990 U.S. Environmental Protection Agency (EPA) study concluded that air, dust, and dermal exposure were significant contributors to total exposure for some pesticides. Inhalation was the "dominant" source of exposure for nearly one quarter of the pesticides studied.

As described in Chapter 3, people can be exposed to pesticides by breathing vapors or dusts, absorbing residues through their skin or eyes, or ingesting residues, granules or baits through hand-to-mouth contact. Children face greater exposures because of their size, behaviors, and lifestyles that put them into contact with pesticide-treated soil, vegetation, indoor surfaces, or areas where pesticide residues or vapors may settle.

Studies of actual pesticide exposure to children in school settings are virtually nonexistent. However, the animal studies and human incidents cited in Chapter 3 provide strong evidence that children can be exposed to pesticides used at school. They may be exposed when they touch a school desk, sit on a carpeted classroom floor, or simply breathe in a room that has been recently treated, or that is near the site of a treatment. They may be exposed to pesticides while "exploring" on a school ground, sitting on recently sprayed grass, picking up a ball that rolls on a treated field, or planting bulbs in a shrub bed for a class project.

Pesticides Are NOT Safe

Too often, parents and school officials presume that because a pesticide product is available, it must be "safe." However, government regulators themselves acknowledge that this is NOT an accurate assumption. Consider the case of just one insecticide, chlorpyrifos, which is a common ingredient of pesticide products used in school and home settings. EPA recently estimated exposure levels that children would face from various types of indoor and outdoor applications of this chemical. The agency concluded that children face exposures that exceed the agency's "level of concern" following a single use of the chemical under a variety of common household application scenarios, even though the applications were made according to label directions.

Since chlorpyrifos is used for similar treatments in schools, and since children spend such a large amount of time at school, it is likely that estimated exposures there would also exceed the agency's "levels of concern." In fact, EPA's assessment specifically noted a "health concern for crack and crevice treatment in schools, day care centers, or other rooms that children may occupy for extended periods of time." Clearly parents and school administrators should be concerned about children's exposure to this pesticide (and others) in school settings, even when they are applied according to label directions.

Consider these startling facts about three herbicides commonly used on school grounds, and widely believed to be "safe" and to break down rapidly into harmless components:

- Glyphosate, the active ingredient of Roundup, has been called **"extremely persistent** under typical application conditions" by the US Environmental Protection Agency (EPA) (US EPA, 1993-2). Tests have shown that it can persist in soil for up to 3 years (Torstensson, 1989). Glyphosate has also been shown to cause **genetic mutations** in tests on human, animal and plant cells (Vigfusson, 1980; Kale, 1995; Rank, 1993).

- The EPA has stated that chronic exposure to lawns treated with oryzalin (the active ingredient of Surflan) "is of concern because oryzalin is a **carcinogen and persistent**. There is a potential for continued, substantial contact with treated surfaces, especially 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).

- Dichlobenil (the active ingredient of Casoron) can **persist in soil for up to five years** (Williams and Eagle, 1979). It kills weeds by emitting a continuous toxic vapor into and above treated soil. It also causes **cancer** in animals, and is classified by EPA as a **possible human carcinogen** (US EPA, 1999-1).

The Risks Are Not Just Theoretical

The scores of actual school pesticide exposure incidents discussed in Chapter 4 and documented in Appendix A provide undeniable proof that children and others are exposed and are harmed by pesticides used at school. Over the past decade, literally thousands of children and school staff have been made ill by pesticide exposures at schools around the country. The incidents included here are likely to be just the tip of the iceberg, as many pesticide exposures go unrecognized and unreported.

Immediate Health Hazards

Exposure to pesticides in a school environment can cause a wide range of harmful effects. Common symptoms that children and school staff have experienced include headaches, rashes, allergic reactions, asthma attacks, nausea, fevers, and other flu-like symptoms. People have experienced symptoms even when pesticides were applied legally and according to product directions. Sometimes exposure symptoms were only temporary, but other times they lasted for days or weeks. Even single exposure incidents have been very disruptive to children's lives and their school experiences.

Most common acute illness symptoms experienced by children and school staff exposed to pesticides at school
(Based on incidents in Appendix A. See Chapter 4 for expanded list of symptoms experienced):

- asthma attacks, difficulty breathing
- dizziness
- eye irritation
- headaches
- nausea
- rashes and skin irritation
- sore throat

Permanent or Lasting Harm

Pesticide exposures at school have also caused profound and lasting harm to children and school staff. In some cases, repeated or continuous exposures to pesticides have caused recurring symptoms such as headaches, nausea and rashes. Some individuals have developed sensitivities to many common chemicals as a result of their exposures. At least one child who was exposed to pesticides at school nearly died.

Another child experienced several episodes where she suddenly lost consciousness at school. Tragically, following a final episode at a park, she never regained consciousness and died. The episodes, including the final fatal one, were later attributed to a serious heart rhythm disturbance. A cardiologist consulted by the family believes that pesticide exposure was the likely trigger of the heart arrhythmia that caused the earlier episodes at school, and the final episode that caused the girl's death.

The parents of another girl who died of cancer believe that the disease was caused by exposure to a weed-killer used at her school. The herbicide their daughter was exposed to has been associated with elevated risks of that type of cancer in humans and animals, and the girl had no other known risk factors. While it is not possible to conclusively prove that this cancer (or any other cancer or chronic disease) was caused by pesticide exposure at school, it is also not possible to prove that the exposure did not cause or contribute to the cancer.

Some of the lasting harms that can be caused by pesticides

Childhood cancers: Numerous studies have shown a positive association between household and yard exposure to pesticides and elevated rates of certain childhood cancers (Leiss, 1995; Buckley, 1994; Davis, 1993; Lowengart, 1987).

Harm to the developing brain: Human case studies show that exposure to nerve poisons during infancy can lead to **severe impairment of motor and mental development** (Ecobichon, 1990). Other studies show that even **low dose exposures** to some pesticides **can affect neurodevelopment and growth in developing animals** (Eskenazi, 1999; NRC, 1993). According to the National Reserach Council, "the data strongly suggest that exposure to neurotoxic [i.e., nerve poisoning] compounds at levels believed to be safe for adults could result in **permanent loss of brain function** if it occurred during the prenatal or early childhood period of development" (NRC, 1993).

Children are especially vulnerable

Scientists believe that **children are especially vulnerable** to the effects of pesticides, for the following reasons:

- Children's **brains and nervous systems** are not completely developed, making them more susceptible to the effects of **nerve poisons** (NRC, 1993; Watanabe, 1990). Several major classes of insecticides are nerve poisons.
- Children's livers and kidneys are **unable to detoxify or filter and excrete** certain chemicals as quickly as adults (NRC, 1993). This contributes to the greater toxicity of some substances to infants and young children.
- Children are growing and their cells are **dividing** more quickly than those of adults, making them vulnerable to the effects of **cancer-causing chemicals** (NRC, 1993).
- Children's **immune systems** are not fully developed until adolescence. This means they may be more susceptible to harm from exposure to foreign compounds such as pesticides (Repetto, 1996; NRC 1993).
- Children receive **relatively greater doses** than adults when exposed to pesticides in their environment, due to the fact that they breathe in a greater volume of air and have a greater skin surface area relative to their smaller body weights (NRC, 1993).

It's Time to Act!

Our children spend long hours of their young lives in school environments. It is our responsibility to ensure that our schools provide the safest learning environment for all students.

School and health officials and government regulators have acted to ensure that children are not exposed to lead, asbestos, or cigarette smoke in school environments. It is time to take the same steps to ensure that children are not exposed to pesticides at school. The nearly one hundred incidents documented in this report provide ample evidence that pesticide exposure is a serious problem in our nation's schools. Literally thousands of children and school staff have been sickened by exposure to these intentional poisons. The additional knowledge that pesticides have been linked to elevated risks of childhood cancers, and other chronic diseases or permanent harm should be enough to inform us that we cannot wait to reduce pesticide exposures at school. Even one childhood cancer, or one child whose ability to learn is impaired by pesticide exposure, is too many.

While some exposures may be preventable, others are clearly unavoidable when pesticides are used in school settings. The use of intentional poisons where children spend so many hours learning and playing is always an invitation to trouble. The use of poisonous and cancer-causing substances in school settings to control cosmetic or nuisance "pests" such as weeds or ants is simply unthinkable.

Recommendations

Fortunately, many safer pest control alternatives are available. NCAP urges schools and school districts to adopt policies based on the following principles (see Chapter 5 for an expanded list of recommendations for parents, schools, states, and the federal government):

1. The Precautionary Principle. Recognize that <u>any</u> use of pesticides in a school setting poses risks and that minimizing or eliminating their use should be a formal and stated goal.

2. Put Children's Health and Safety First. Consider the use of pesticides only if pests themselves present a health and safety hazard, not for cosmetic or nuisance "pests" such as weeds or ants. Never use pesticides for head lice.

3. Eliminate the Most Hazardous Pesticides. Do not use pesticides if animal testing, human exposure incidents, or other reliable evidence shows that the product or its constituent ingedients are:

- highly or moderately acutely toxic;
- pose environmental risks;
- are known or suspected to cause cancer, or to damage the reproductive, nervous, immune or endocrine (hormone) systems; or
- are known to aggravate allergies, asthma or chemical sensitivities.

Do not use pesticides unless all solvents and other "inert" ingredients are disclosed.

4. Honor the Public "Right to Know." Keep records of all pesticide use by school site and treatment area. Provide public access to the records, and to product labels and Material Safety Data Sheets (MSDSs). Provide advance written and posted notification if pesticides are to be used.

Chapter 1
Pesticide Contamination of Indoor Air and Surfaces

Pesticide and solvent vapors can persist in indoor air for many hours, even when applied according to label directions and when rooms are ventilated. Pesticides applied beneath a building can contaminate indoor air for weeks or even years.

- Many pesticides commonly used in schools can persist in indoor air. See Table 1-1 for data on the persistence in air of selected pesticides commonly used indoors.

- At 21 days following application to cracks and crevices in a room, air levels of diazinon, a commonly-used organophosphate insecticide, were found at nearly 20% of levels immediately after application (Leidy, 1982).

- One hour following aerosol spraying of two pyrethroid pesticides in an apartment, the active ingredients were still present at 15% of the air concentration measured immediately after spraying. This was despite a window being opened to allow for ventilation (Class, 1991).

- Three days following application of the pesticide chlorpyrifos to crack and crevices in a room, air concentrations of the chemical were between 4 and 40% of the levels measured immediately after treatment (depending on whether aerosol or compressed air methods were used) (Wright and Leidy, 1978).

- One study showed that air concentrations of organic solvents peaked 10-14 hours after both broadcast and perimeter applications of insecticides to rooms (Bukowski, 1996). The levels of solvents found were high enough to be associated with adverse health symptoms in some people, such as headache, irritated eyes, chest tightness. For the broadcast application, solvent levels remained elevated in air 24 hours after application.

- Teachers and students carried monitors to measure indoor air concentrations of one pesticide following its application at their North Carolina school. Air monitoring began four days following the application, and continued for four weeks. Half of the samples collected over the four week period showed detectable levels of the pesticide, including some samples collected 21 days after the application (Maas, 1993).

- In a case reported to the state of California, a school district employee applied boric acid dust in cracks and crevices and around baseboards of a kitchen. When fans were turned on the next morning, some of the boric acid became airborne. Twelve employees became ill with symptoms such as headache, sore throat, nausea and burning eyes (Maddy, 1990).

- One study looked at air levels of a pesticide that had been applied as a dust to cracks and crevices of three dining facilities. The results showed "significant" air levels at one and three days following application, even though less than 1/20th of a gram of the pesticide was applied in each facility (Wright, 1992).

- One study found that use of (dichlorvos-containing) pest strips resulted in contamination of indoor air, and of textiles and food in the room (Weis, 1998).

- Air samples collected from living spaces of sixteen houses for 2 years following application of the pesticide chlorpyrifos to soil under the houses showed measurable amounts of the pesticide in all samples at all time intervals, with the highest levels occurring at one year after application (Wright, 1988). Additional testing showed the pesticide still in the ambient air of the homes four years after application (Wright, 1991).

- "Unacceptable" levels of two pesticides were found in indoor air four days after an insecticide "bomb" was used in a school kitchen. The chemicals were still detected in air 10 days following application (White, 1987).

Table 1-1. Persistence* of Selected Pesticides in Indoor Air and on Indoor Surfaces

***Note:** Persistence is the length of time until all measurable residues of the pesticide (in this case, the active ingredient) are gone. Indoor persistence can vary considerably depending on conditions (temperature, humidity, light, ventilation, etc.) Also, in many cases, the values listed below are simply the last times for which samples were analyzed in a given study. Actual persistence may be much longer.

Pesticide	Product Name(s)	Persistence in Air	Persistence on Surfaces
chlorpyrifos	Dursban, many others	> 21 days (Maas, 1993) (unspecified application method/school) > 4 years (Wright, 1991) (termiticide application/homes)	> 6 months (Wright, 1984-2) (unspecified application method/ commercial kitchens)
diazinon	Knox Out, many others	> 21 days (Leidy, 1982) (crack and crevice spray/room)	> 42 days (Wright, 1984-1) (aerosol and compressed air crack and crevice spray/dorm room)
cyfluthrin	Tempo and others	???	> 60 hours (Class, 1991) (aerosol spray/carpeted room)
cypermethrin	Demon, Cynoff, others	> 84 days (Wright, 1993) (crack and crevice spray/dorm rooms)	> 84 days (Wright, 1993) (crack and crevice spray/dorm rooms)

Many methods of pesticide application including fogging, broadcast spraying or dusting, and baseboard "spot treatments" can contaminate indoor surfaces.

- Many pesticides commonly applied in schools may leave persistent residues on indoor surfaces. Table 1-1 provides information about the persistence on surfaces of selected pesticides commonly used indoors.

- Aerosol foggers (such as flea bombs) can result in particularly high contamination of room surfaces (including floors, walls, counter tops, and the insides of cabinets), leaving residues hundreds of times larger than those left from crack and crevice application methods (Wright and Jackson, 1974).

- In one study, residues of pesticides aerosol-sprayed in a large carpeted room were deposited on surfaces rapidly (within 15 - 30 minutes). Residues of one of the pesticides, cyfluthrin (a synthetic pyrethroid insecticide), were found to be reduced only slightly when measured 60 hours after spraying (Class, 1991).

- One study found that "a considerable amount" of an insecticide applied in "spot treatments" to baseboards was splashed on the wall above the baseboards (Wright, 1989; Leidy, 1993). The authors expressed concern about the potential for young children to come into contact with contaminated baseboard and wall surfaces.

Even "crack and crevice" applications of pesticides around the perimeter of a room can result in residues being deposited on surfaces and furniture throughout a room, and in elevated air concentrations for many hours following application.

- Detectable residues of two common insecticides, diazinon and chlorpyrifos, were found on plates in non-target areas of rooms within one-half hour after they were applied to cracks and crevices in the room (Wright, 1976). In a later study, residues of the same insecticides were found on nontarget surfaces for 42 days (the last day measurements were taken) following crack and crevice application (Wright, 1984).

- Five hours after a crack and crevice application done according to label instructions, air concentrations of the insecticide were high enough to kill caged flies near the ceiling (Wright, 1976).

Once in an indoor environment, toxic residues can remain for days, weeks, or months, and may accumulate in dust and carpets.

- The breakdown of pesticides can be relatively slow indoors, where residues are protected from sunlight, rain, temperature extremes, and microbial action. Even a relatively "nonpersistent" insecticide can remain for several weeks within a structure protected from direct sunlight and ventilation (Leidy, 1993; Leidy, 1984).

- In a nine-home study in North Carolina, 20 of 31 target pesticides were detected in carpet dust (and 15 different pesticides were detected in indoor air). In some cases, residues were found even though there had been no known use of the pesticides on the premises. This was thought to be due to fact that pesticides may be tracked in from outdoors, and may also persist and accumulate in carpets for many years (Lewis, 1991).

- Another study of several homes found pesticides in much greater concentrations in carpet dust than in air (US EPA, 1990-1). Pesticide residues may remain in carpets for extended periods (Lewis, 1994).

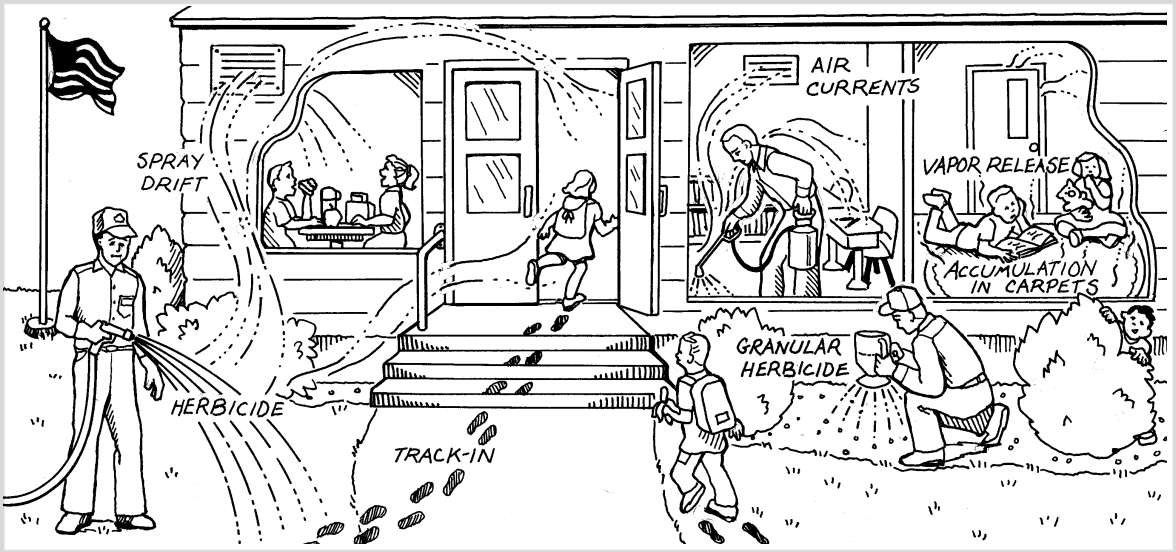
- Staff at a German kindergarten complained of health effects 1 week following insecticide application to areas of suspected cockroach infestation. Even after cleaning, "considerable concentrations" of three insecticides were measured in dust and textiles 15 days after the application. One of the insecticides was found in baby mattresses, children's books, and textiles 2 months after the application. Even after another cleaning and renovation, levels were still "surprisingly high" in dust and wood from a play house (Fischer and Eikmann, 1996).

- One study found chlorpyrifos on walls and food-contact surfaces in commercial food-preparation establishments for months following application (by unspecified methods), albeit at low levels. The authors also noted that "it may be impossible to keep insecticides from food-contact surfaces even if the label instructions are followed" (Wright, 1984-2).

Plush surfaces like carpets, upholstered furniture, stuffed animals, or pillows can also absorb pesticides, and later release vapors back into the air.

- One study showed that air concentrations of pesticides actually increased over a three to seven hour period following broadcast spraying in a carpeted room, because the carpet had absorbed, and later released pesticide vapors (Fenske, et al, 1990). The study found that pesticide concentrations were higher in the infant breathing zone (near the floor) than in the adult breathing zone. Twenty-four hours later, air concentrations of the pesticide in both the adult and infant breathing zones were higher than they were immediately after the spraying, even when rooms were ventilated.

- One study showed that after a single broadcast use of chlorpyrifos by certified applicators in apartment rooms, the insecticide continued to accumulate on children's plush toys (and hard plastic toys and surfaces) for 2 weeks after the spraying (Gurunathan, 1998).



How pesticides can enter, contaminate, and be dispersed through a school

Air currents and fans, or forced air heating and ventilation systems can carry pesticide vapors or residues around a room, from one area of a school to another, or even into classrooms from outdoors. Pesticides can even move between rooms through cracks and crevices.

- Higher percentages of flies in ceiling cages died following crack and crevice insecticide treatment when fans were on during application. The experiment showed that forced air increased the movement of pesticides out of crevices and towards the ceiling (Wright, 1976).

- One study found that when the insecticide diazinon was applied to cracks and crevices of rooms, residues were found "in appreciable concentrations" at 21 days in treated rooms, and also in rooms adjacent to treated rooms and above and below treated rooms (Leidy, 1993; Leidy, 1982). A similar study found residues of cypermethrin up to 84 days in air, and on walls, floors, and furniture. Residues also moved to adjacent rooms by the 7th day and persisted there for 84 days (Wright, 1993).

Actual incidents show that pesticides can be sucked into schools via ventilation systems, exposing children and staff.

- At one Oregon elementary school, twelve students and two adults were treated by paramedics after herbicide fumes entered classrooms via air intake vents (see Appendix A, Oregon incident #3).

- An Ohio high school was evacuated and seven staff members and nine students experienced dizziness and difficulty breathing and were treated at local hospitals after fumes of an herbicide being applied outdoors were drawn into the school's ventilation system (see Appendix A, Other States incident #5).

- Thirty-five youngters became nauseated and their Florida elementary school was evacuated when wind blew insecticide fumes from a nearby park into the school's air conditioning system (Sagan, 1991).

Residues can also be tracked indoors from lawn applications.

- One study found that residues of herbicides used outdoors on lawns were tracked in on shoes and deposited on carpets and floors and in household dust (Nishioka, 1996). The data showed that residues could be expected to be found in carpet dust up to 1 year after lawn application.

- A followup study showed that residues of one of the herbicides, 2,4-D, were found in carpet dust of 60 percent of houses sampled (Colt, 1998). Another study found 2,4-D in dust from all houses tested, with concentrations highest in the week following a lawn care 2,4-D application. The highest concentrations of 2,4-D were found in homes with active pets and children (Nishioka, 1999-1). 2,4-D was also found in indoor air and on tables and window sills (Nishioka, 1999-2).

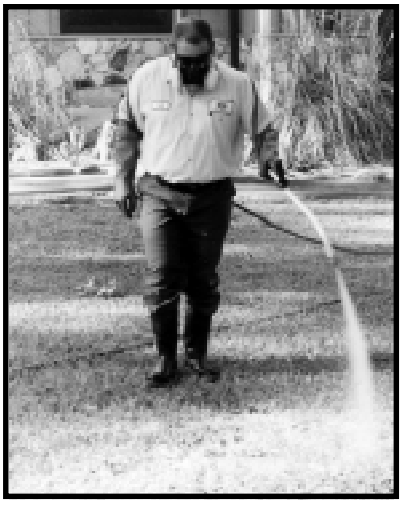
Chapter 2
Pesticide Contamination of Soil, Vegetation, Turf, and the Outdoor Environment

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 degration 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 (Glotfelty 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).

Persistence in soil of some weed-killing pesticides commonly used by schools

(See Table 2-1 above for citations)

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.

Chapter 3
Breathing, Touching, Tasting: How Children Can Inhale, Absorb, or Ingest Pesticide Residues and Vapors

Multiple Routes of Exposure

Many pesticides are readily absorbed into the human body via multiple routes, including ingestion, inhalation into the lungs, and absorption through the skin or eyes.

- Organophosphate insecticides are absorbed rapidly following inhalation (Vale, 1998; Reigart and Roberts, 1999), ingestion, and skin penetration (Reigart and Roberts, 1999).

- Carbamate insecticides are readily absorbed by inhalation and ingestion, and somewhat by skin penetration (Reigart and Roberts, 1999).

- Pyrethrin insecticides are absorbed across the gut and via the lungs, but only slightly across (intact) skin (Reigart and Roberts, 1999).

- Chlorophenoxy herbicides like 2,4-D are readily absorbed when ingested, and also can be absorbed via the lungs (Reigart and Roberts, 1999).

- Warfarin-type rodenticides such as brodifacoum are efficiently absorbed via ingestion, and can also be absorbed via the skin (Reigart and Roberts, 1999).

When multiple routes of exposure to just one commonly-used pesticide are considered, people are at risk from many indoor and outdoor applications.

- The US EPA recently reviewed exposure risks of one registered pesticide, chlorpyrifos, which is commonly used in homes and schools. The agency concluded that for seven of eight application scenarios considered, estimated exposures to residents following treatments to their homes or yards exceeded the agency's "level of concern." The scenarios included common application sites and methods also used in schools, such as termiticide treatments, crack and crevice and spot treatments, and lawn treatments. The risk calculations factored in multiple routes of exposure, including inhalation, oral, and dermal (US EPA, 1999-2).

Infants and children may be exposed to pesticide doses of public health concern in indoor settings when multiple routes of exposure to just a single pesticide are considered.

- One study looked at potential human exposure to indoor use of three insecticides--propoxur, dichlorvos, and chlorpyrifos. Using data from previous studies of actual residues and air levels found following use of these chemicals indoors, the authors estimated the dose of insecticide that an infant playing in a treated room might absorb via skin, ingestion and inhalation. They concluded that an infant could receive a toxic dose of any of the three insecticides in the exposure scenarios considered (Berteau, et al., 1989).

- In its recent review of the risks of exposure to the insecticide chlorpyrifos, the EPA specifically noted a "health concern for crack and crevice treatment in schools, day care centers, or other rooms that children may occupy for extended periods of time" (US EPA, 1999-2). The agency's risk calculations assumed that inhalation would be the primary route of exposure from applications in some rooms, while oral and dermal exposures would be greatest in other rooms. The agency also noted that some of the exposure estimates would be even higher if oral and dermal exposures to the residues on plush toys were considered.

- Another study found that when plush toys were placed in a room after it was sprayed with chlorpyrifos, that for at least a week following spraying, children could be exposed (via skin and mouth contact) to doses of public health concern from residues that accumulated on the toys (Gurunathan, 1998).

- A study for the US Environmental Protection Agency estimated the inhalation and ingestion exposure doses that a one-year-old child would experience from indoor contamination following application of the herbicide 2,4-D to a home lawn. The researchers concluded that the highest estimated exposures were close to the maximum dose that the agency has determined may "be without an appreciable risk of deleterious effects during a lifetime" (Nishioka, 1999).

Inhalation Exposure

Inhalation can be a significant source of pesticide exposure.

- A 1990 government study that attempted to assess the relative exposures that U.S. residents face from pesticides via dietary, air, water, dust, and dermal routes of exposure concluded that inhalation was the "dominant" source of exposure for nearly one quarter of the pesticides studied (US EPA, 1990-1).

- Children breathe in a greater volume of air relative to their body weight than do adults, and thus receive a greater dose of pesticide than an adult does when exposed to a similar concentration in air (NRC, 1993).

Young children are at particular risk of inhalation exposure, both indoors and out, because of their size, and because they sit, crawl or roll on the ground, nearest to the application sites of many pesticides, or sites where pesticide vapors and residues may settle.

- One study estimated that in the first two days following application of the pesticide chlorpyrifos to a carpeted room, infants playing on the carpet would have absorbed (via skin and respiration) a pesticide dose 10 to 50 times higher than federal regulators consider acceptable (Fenske, 1990).

- A study done on infants and children admitted with pesticide poisoning symptoms to a major U.S. children's medical center found that a surprising number of them had become intoxicated by playing on carpets that were recently sprayed or fogged with organophosphate pesticide products (Zweiner and Ginsburg, 1988).

Many actual incidents show that children can inhale toxic doses of insecticides or herbicides from applications made at or near schools.

- At one Oregon school, twelve students and two adults experienced nausea and headaches and were treated by paramedics after breathing herbicide fumes that entered classrooms via air intake vents (See Appendix A, Oregon incident #3).

- Twenty-three students and an aide at a California school developed stomach cramps, sore throats, coughing and gagging after smelling fumes of an insecticide that had been applied an hour earlier at a neighboring apartment (See Appendix A, California incident #8).

- Nine students and seven staff members at an Ohio school experienced dizziness and difficulty breathing and were treated at local hospitals after breathing fumes of an herbicide that seeped into the building following application to the grounds outside (See Appendix A, Other States incident #5).

- An asthmatic student developed headache, dizziness and abdominal cramps after inhaling fumes from an insecticide that had been applied to air conditioning units of a California school (See Appendix A, California incident # 21).

- Scores of children and adults reported headaches, abdominal pain, breathing difficulty, and other symptoms after inhaling vapors of insecticides that had been applied to classrooms at their Louisiana elementary school (see Appendix A, Other States incident #14).

- Students complained of sore throats, and PE teachers, an outdoor custodian and other staff members developed sore throats, headaches, chest pain, burning eyes, and difficulty breathing after playing on fields that had been treated a day earlier with several herbicides. Doctors consulted by several individuals stated that respiratory and eye symptoms were likely caused by chemical exposure (See Appendix A, California incident #30).

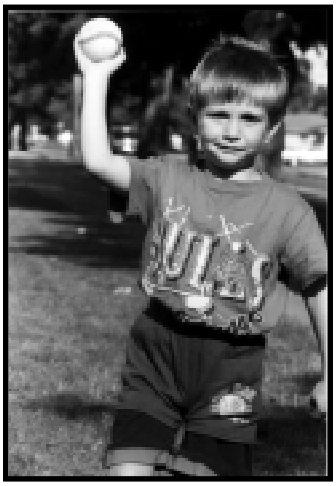
- One school staff member lost consciousness and two were hospitalized after entering a school on Monday and breathing insecticide vapors that remained in the air from a Friday evening "bug bombing" (White, 1987).

Skin Absorption

Evidence from human studies shows that pesticide residues in the environment can be transferred to people's skin and absorbed into their bodies.

- One study estimated potential dermal exposure to pesticide residues on a carpeted floor in rooms that were "fogged" 2.5-16 hours earlier. Adults participated in exercise routines on the floors of the treated rooms. Testing showed measurable residues of pesticides on their clothing in all scenarios, including when they entered the fogged room 15 hours after the treatment, and after a thirty minute ventilation period (Ross, 1990).

- One study estimated the exposure a person would receive from skin contact with pesticide-contaminated vegetation. Adults wearing only T-shirts and shorts entered an area that had been treated with the weed killer 2,4-D one hour earlier. They walked, sat, and laid on the herbicide-treated surface for one hour. Three of five of the volunteers had detectable levels of 2,4-D in their urine following the exposure (Durkin, et al., 1995).



- One study looked at skin absorption of 10 insecticides and 2 herbicides. Results showed that all of the chemicals were absorbed by human skin, with measurable levels excreted in the urine in each of five days following exposure (Feldmann and Maibach, 1974). Greatest skin absorption occurs through the scrotum, head, face, and neck, and when skin is damaged or covered with clothing following exposure (Wester and Maibach, 1985).

Evidence from animals also confirms that pesticides applied to lawns can be absorbed into the body.

- A 1994 study showed that dogs living in and around residences with recent 2,4-D treatment to the lawns absorbed measurable amounts of the herbicide, which was excreted in their urine for several days after application (Reynolds, 1994).

Children are at particular risk of dermal exposure to pesticides, both indoors and out, because of their physiology, and their behavior and lifestyles that put them in frequent contact with many surfaces that may be contaminated with pesticide residues.

- Children have a greater skin surface area relative to their body weight than do adults. A child with an equal amount of skin exposure to a pesticide would receive a greater dose relative to body weight than an adult with the same exposure (NRC, 1993).

- Indoors, children crawl, roll or sit on carpets and floors, closer to sites where pesticides are applied or where residues settle.

- Outdoors, children roll on grass, hide or play in shrubbery, and slide or tumble around baseball infields and soccer and football fields, all sites that are commonly treated with pesticides.

- Infants and children can incur a significant portion of their total pesticide exposure from dermal contact with residential dust, tracked-in soil, and dislodged surface residues (Zartarian, 1998; Lewis, 1994).

- One study estimated that infants playing on a chlorpyrifos-treated carpet would absorb a dermal dose of the pesticide up to 40 times higher than federal regulators consider acceptable (Fenske, 1990).

- Children's dermal exposure can lead to health risks not only through skin absorption but also through ingestion of chemical residues or house dust adhering to the skin surface (Zartarian, 1998; Lewis, 1994).

Ingestion

Young children are at particular risk from ingestion exposure. They spend a lot of time on the floor or the ground, where they are more likely to come into contact with pesticide residues. They also exhibit frequent hand-to-mouth behavior, ingesting relatively large amounts of dust or soil (and any contaminants) in the process.

- One study estimated that children under the age of five ingest 2.5 times more soil from around the home than adults, though they have only 20% of the body weight. Thus, they have at least twelve times greater potential health risk than an adult from any pesticides or other toxics in the dust (Roberts, 1989; Hawley, 1985 as cited in Lewis, 1994).

- In another study, pesticide residues on children's hands were measured after the children had been in a test home for at least an hour. Residues on the children's hands were found to correlate with pesticide levels found in carpet dust. While researchers estimated that potential air exposure (to pesticide residues in house dust) exceeded ingestion exposure in most cases, the authors noted that dust ingestion could constitute a substantial portion of a child's exposure to pesticides (Lewis, 1994).

- A study of pesticides tracked in from outdoors noted that children's hand-to-mouth activity can promote ingestion of contaminated carpet dust. The authors added that they would assume that "chronic indoor exposure will follow a lawn application" and may result in measurable levels of pesticides in children's urine (Nishioka, 1996).

- Several cases have been reported of (adult) golfers being made ill by exposure to residues they absorbed from licking golf balls that had rolled on pesticide-treated fairways (Leonard, 1997; Johnston, 1998). This evidence suggests that children may also be exposed to pesticide residues from licking balls (or fingers that have touched balls) that roll on school fields where pesticides have been applied.

Children are at risk from accidental ingestion of pesticide granules or baits used at school. Even baits in packages or bait stations may pose a hazard.

- One first grader nearly died after touching and tasting insecticide granules that he "discovered" on his Washington school playground (see Appendix A, Washington incident #11). In another incident, a young child played with granules and put his fingers in his mouth following treatment of a soccer field at an Oregon school (see Appendix A, Oregon incident #7).

- Ingestion of rodent baits is a common cause of childhood poisoning. Nearly 16,000 cases of childhood exposures to rodenticides were reported to the nation's poison control centers in 1996, 36 of them resulting in life-threatening symptoms or death (Blondell, 1997). The EPA reports that the human exposure incidents that are reported may represent less than half of those which actually occur (US EPA, 1998-3).

- In one episode, a Florida child nearly ate a packet of rodent bait that had been inadvertently placed in his school-provided picnic lunch bag (Althouse, 1996).

- The EPA recalled one brand of supposedly child-resistant pesticide-containing bait station in 1994, after scores of reports of children ingesting the bait. The agency said "a one time exposure to one bait station has the potential to cause adverse reproductive and/or developmental effects as the child develops" (Taylor, 1994; EPA issues SSURO, 1994).

Chapter 4
Learning the Hard Way: Actual School Pesticide Exposure Incidents

School Pesticide Exposures and Illnesses

Just how often are children and school staff actually exposed and made ill from pesticides in school settings? Nobody really knows the answer, for a variety of reasons that will be discussed briefly in the next section.

We do know that about 2,300 school pesticide exposure cases were reported to Poison Control Centers around the U.S. between 1993 - 1996 (US GAO, 1999). We also know that the EPA has information from pesticide manufacturers about 80 incidents involving "adverse effects" due to pesticide exposures at school between the years 1992 to 1997 (US GAO, 1999).

The Tip of the Iceberg

The above incident reports collected by the federal government are likely to represent just the "tip of the iceberg" of the problem of school pesticide exposures, however. Some of the many reasons for this include:

- Pesticide use is often a hidden function at schools (and elsewhere). Few schools post areas treated with pesticides or provide advance notification if chemicals are applied. Even if a child or school staff member does experience symptoms, they are unlikely to associate the symptoms with exposure to a pesticide when they are not aware that such a substance has been used. Many school pesticide exposures and illnesses are likely to go unrecognized for this reason.

- Common symptoms of pesticide exposure include headache, dizziness, nausea, and diarrhea (Reigart, 1999). Sore throats were also a common symptom in incidents listed this report. Parents, doctors, or school nurses who are unaware that a pesticide application has occurred, or are not trained to ask about possible pesticide exposures, are unlikely to differentiate these symptoms from those of common ailments such as colds or the flu.

- Chronic health effects and illness, such as cancer or reproductive damage, are even less likely to be correlated with pesticide exposures given that they may be diagnosed only months or years after the exposure.

- There is no comprehensive national system to track pesticide-related illnesses and exposures. Some states, including California, Oregon, Washington, Florida, New York, and Texas, require that doctors report suspected pesticide illnesses to a state tracking system (Reigart, 1999). However, these reporting systems have many limitations. Health officials acknowledge the likelihood that there are cases of pesticide exposure at schools (and elsewhere) that are never reported to state agencies. In part, this is because doctors and school officials are unaware of, or ignore, reporting requirements or because some states require reporting only of occupational exposures (Rosales, 2000; CDPR, 1999; Richmond, 2000).

About the School Pesticide Exposure Incidents Listed in Appendix A

Appendix A of this report provides summary narratives describing nearly one hundred actual incidents where children and school staff have been exposed, and often made ill, by exposure to pesticides at U.S. schools. The list includes selected incidents that have occurred at schools in twenty-two states since 1986. In many cases, the information about these incidents comes from state agency files. In some cases, however, school districts did not report incidents to state agencies, and we know about them only because they were reported in newspapers, or reported to NCAP or other organizations by parents or school employees. Many other incidents that were reported to state agencies or described in newspaper or personal accounts could not be included due to lack of space or inadequate documentation.

The incidents included in the list are unevenly distributed across the states (see Table 4-1). This is because we requested information about school pesticide exposure incidents only from selected states. More incidents are included from states with better and more responsive pesticide illness tracking systems, such as California, Oregon, and Washington. Agencies in other states were unable to search for school-related incidents except manually and/or at prohibitive cost. Some agencies destroy pesticide case files after three years, which made it impossible to retrieve information about previously identified school exposure cases in those states. Agencies in other states failed to respond to requests for data.

Relatively few of the incidents in Appendix A are from the past two years, because of the lag between the time incidents are reported to state agencies and the time that summary reports or completed agency case files about these incidents are available for release to the public.

Most of the incidents included in Appendix A involve pesticide applications made to school property. Only a few incidents are included where students or teachers reported exposure from pesticides that drift onto school grounds from applications made to adjacent properties, or from nearby agricultural, roadside, or other spray operations. However, such cases are also numerous.

The majority of the California incidents listed in Appendix A were identified from summaries provided by the state's Pesticide Illness Surveillance Program (CPISP). While California's system is one of the best and most responsive of the pesticide illness tracking programs in the country, it is heavily biased toward collecting data from physicians who are handling worker's compensation claims. Doctors are much less likely to report pesticide illness cases if they involve people who are not filing worker's compensation claims (e.g., students, rather than school district employees). Other state's systems have similar biases that lead to an under-reporting of nonoccupational pesticide exposure incidents (Rosales, 2000). To some extent the incidents included in Appendix A reflect this bias. A significant number of the incidents from some states describe exposures to school employees but not students. The reader should not take this to mean that students were not exposed in these or other incidents, but only that student exposures would have been less likely to have been reported to the state tracking system.

Finally, a few cases are included in Appendix A where no pesticide exposures were alleged or documented, but where illegal (or irresponsible) pesticide applications were made at schools. In addition, there are some cases where people have alleged exposure, but state investigations have failed to confirm it. This does not mean that exposure did not occur, but only that, for a variety of reasons, it was not possible for investigators to document exposure or prove an association between the exposure and reported health effects. In some cases, there were long delays between the time an incident occurred and the time it was reported. Thus, state investigators were unable to conduct a timely investigation. In other cases, pesticide residues may have been found and/or exposures documented by eyewitness accounts, but investigators did not believe that reported health effects were likely to be caused by the exposure. We believe there is room for interpretation in the few cases in this category included in Appendix A.

What Can We Learn From These Pesticide Exposure incidents?

- Children and school staff in states around the Northwest and across the country have been exposed to and made ill by pesticides in school settings. See Table 4-1 for a key to exposure incidents in Appendix A by state.

- Sometimes school pesticide exposure incidents are very disruptive and/or costly, both to the school district and to persons who are exposed. Many of the incidents described in Appendix A involve classroom or school evacuations, exposure of multiple students or school staff members, emergency medical treatment of affected individuals, payment of fines, major cleanups, negative media publicity, and lawsuits. A few cases have even resulted in deaths, near-deaths, chronic illnesses, or permanent disabilities of exposed individuals. See Table 4-2 for a key to selected incidents in Appendix A where such major disruptions occurred or costs were incurred.

- Students and school staff have been exposed to and made ill by many different pesticides used in school settings. Indoor use of organophosphate, carbamate and synthetic pyrethroid insecticides were frequent causes of health problems in the incidents listed in Appendix A. However, exposures to many different herbicides (weed-killers) also have caused illness. So have exposures to certain insecticides like boric acid, avermectin, pyrethrins, or methoprene that are often found on lists of "least-toxic" pesticides. See Table 4-3 for a list of the pesticides that were involved in exposure incidents in the list in Appendix A. See Table 4-4 for a list of symptoms reported as a result of the pesticide exposures.

- Pesticides are commonly misapplied or used illegally in school settings. Banned or unregistered pesticides are used by some school districts. Pesticides are sometimes applied by unlicensed applicators, including students, teachers, coaches, or others. Pesticides are often applied in a negligent manner or contrary to label directions. See Table 4-5 for a key to incidents in Appendix A involving use or storage of banned pesticides, pesticide applications made by unlicensed applicators, pesticides applied contrary to product label directions, and more.

Table 4-1: States of occurrence of school pesticide exposure incidents included in Appendix A (CA = California, ID = Idaho, MT = Montana, OR = Oregon, WA = Washington, OS = Other States subsections of Appendix A).

State	Number of incidents included	Incidents in Appendix A
Arizona	1	OS #26
California	35	CA subsection (pg. A2)
Florida	1	OS #22
Hawaii	1	OS #28
Idaho	8	ID subsection (pg. A9)
Indiana	1	OS #17
Louisiana	2	OS #1, 14
Maryland	1	OS #9
Massachusetts	1	OS #6
Minnesota	2	OS #12, 19
Montana	1	MT subsection (pg. A9)
New York	5	OS #2, 16, 20, 25, 27
New Jersey	1	OS #21
Ohio	2	OS #5, 18
Oregon	15	OR subsection (pg. A10)
Pennsylvania	1	OS #15
South Carolina	2	OS #3, 24
South Dakota	1	OS #7
Texas	3	OS #10, 11, 13
Washington	11	WA subsection (pg. A13)
West Virginia	1	OS #23
Wisconsin	2	OS #4, 8

Table 4-2: Most disruptive or costly school pesticide exposure incidents listed in Appendix A* (CA = California, ID = Idaho, MT = Montana, OR = Oregon, WA = Washington, OS = Other States subsections of Appendix A).

Disruption	# Incidents	Incidents in Appendix A
Classroom or school evacuations/closures	16	CA #20, 29, 32; OR #3, 8; OS #5, 6, 11, 13, 16, 18, 23, 25, 26, 27, 28
Multiple persons exposed	44	CA #4, 5, 8, 9, 10, 11, 12, 17, 24, 27, 30, 31, 32, 33, 34, 35; ID #3, 5, 8; OR #1, 3, 6, 7, 8, 9, 10, 13, 15; WA #5, 6, 9, 10; OS #1, 3, 5, 13, 15, 19, 20, 21, 22, 23, 26, 28
Death or near-death of exposed individual	3	CA #7; WA #11, OS #17
Long-term or permanent disability of exposed individual	3	CA #30; OR #4; OS #15
Emergency room visits/hospitalizations	9	CA #5, 8, 12, 34; OS #8, 11, 19, 22, 26
Major/expensive cleanups	4	OR #8; OS #14, 20, 23
Lawsuits	6	CA #7, 12; WA #11; OS #14, 20, 23
Worker's compensation claims filed	many	nearly all CA incidents, WA #7, 8, 9, 10
Fines levied against school district or pest control contractor	many	CA #29, 31; OS #21, 23
Negative media publicity	24	CA #2, 6, 7, 12, 26, 27, 29; OR #3, 8; WA #2, 11; OS #3, 5, 6, 13, 14, 19, 20, 21, 22, 23, 24, 26, 28

* Other incidents listed in Appendix A may also have had these disruptive or costly aspects, but insufficient details were recorded or documented to allow inclusion here.

Table 4-3: Active ingredients of pesticides involved in school exposure incidents listed in Appendix A (CA = California, ID = Idaho, MT = Montana, OR = Oregon, WA = Washington, OS = Other States subsections of Appendix A).

Insecticides	**Incidents in Appendix A**
Organophosphates	
acephate	CA #24
chlorpyrifos	CA #14, 15, 18, 24, 26, 27, 32, 33; MT #1; OR #6, 8, 10,13; OS #3, 10, 15, 20, 28
diazinon	CA #26, 29; WA #5; OS #14, 20, 24, 27
dichlorvos	CA #32; OR #8
disulfoton	ID #6 (no exposure documented); WA #11
malathion	CA #8, 34; OR #1; WA #8; OS #13, 18, 19, 25, 26
parathion	CA #35
propetamphos	CA #11, 17; OR #11, 15; OS #9
Carbamates	
bendiocarb	CA #24, 26, 28; OS #5
carbaryl	CA #9; ID #2 (no exposure documented)
propoxur	CA #22; OS #6
Organochlorines	
chlordane	OS #4 (no exposure alleged/documented), 23
lindane	OS #14, 24
Pyrethrins/pyrethrum	CA #4, 12, 16, 20, 24, 25, 29; OR #5; WA #9, 10; OS #6, 21, 22
Synthetic pyrethroids	
allethrin	CA #9, 19
cyfluthrin	CA #13; OR#10; OS#22
cypermethrin	CA #23
esfenvalerate	WA #7
fenvalerate	CA #25
phenothrin	CA #9; WA #9; OS #1
resmethrin	CA #21; WA #4,10; OS #20, 21
tetramethrin	OS #1
Others	
alkyl dimethyl benzyl ammonium chloride	OS #7
avermectin	OS #8
boric acid	CA #24, 31; OS #8
methoprene	CA #17
methyl bromide	CA #6
potassium salts of fatty acids	WA #3
unknown	OR #12

Herbicides (weed-killers)	**Incidents in Appendix A**
bromacil	OS #5
2,4-D	CA #30; ID #3; OR #2, 3, 7; WA #2; OS #16, 17
dicamba	CA #30
dichlobenil	WA#6
diesel fuel	OR#9
glufosinate	WA #2
glyphosate	CA #1, 3, 30; OR #3, 4; WA #1 (no exposure alleged)
MCPA	CA #30
MCPP	OR #7
naphtha	OR #14
oxadiazon	CA #10
oxyfluorfen	WA #2 (no illness alleged), 7
pentachlorophenol	CA #5, OR #14
prometon	CA #5
simazine	CA #2
tetrachlorophenol	CA #5
triclopyr	OR #2; WA #2
unknown	OS #11

Table 4-4: Acute illness symptoms* reported in school pesticide exposure incidents listed in Appendix A (CA = California, ID = Idaho, MT = Montana, OR = Oregon, WA = Washington, OS = Other States subsections of Appendix A).

Symptom	Incidents in Appendix A
Allergic reaction/anaphylactic shock	CA #4, 16; OS #9, 23
Asthma attack, difficulty breathing, shortness of breath, or respiratory problems	CA #1, 2, 3, 4, 11,12, 14, 16, 20, 22, 30, 34; OR #6; WA #8, 9, 10; OS #5, 8, 14, 18, 20, 23, 26, 28
Bronchitis	CA #4; WA #9
Chemical sensitivity	CA #1, 30; OR #4; OS #16
Chest pains, chest tightness	CA #1, 13, 27, 30; WA #11
Cough	CA #8, 10, 12; WA #7; OS #23
Diarrhea	CA #12, 25, 33, 34; WA #10; OR #4, 8, 15; OS #14
Dizziness, lightheadedness, disorientation, or weakness	CA #5, 10,11, 13, 15, 18, 21, 27, 28, 29, 32, 33, 34, 35; OR #6, 8, 10; WA #10; OS #5, 8, 19, 22, 26, 28
Eyelid irritation, swelling, itchiness	CA #24
Eye irritation, burning, tearing, vision problems, or conjunctivitis	CA #9, 10, 17, 22, 24, 27, 30, 31, 34; OR #8; WA #3, 10, 11; OS #18, 20
Fainting, loss of consciousness	CA #7, 29, 32; WA #11
Fatigue, drowsiness, tiredness or exhaustion	CA #12, 21, 26, 27, 35; MT #1; OS #18, 23
Fever	OS #15
Gagging, choking	CA #8; WA #7
Hair loss	CA #12, 27
Headache	CA #5, 9, 10, 11, 13, 17, 21, 22, 23, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35; ID #5; OR #3, 4, 6, 8, 10; WA #4, 9, 10; OS #6, 8, 13, 14, 15, 18, 19, 20, 21, 26, 28
Heart arrhythmia	CA #7
Loss of concentration	MT #1
Mouth burns or blisters, bad taste in mouth, gum boils	CA #2; OS #7, 21, 22
Muscle or joint aches	MT #1; OR #4; OS #23
Nasal irritation, sinus problems, congestion, nose bleeds	CA #1, 4, 6, 19, 22; WA #10
Nausea, vomiting, stomach or abdominal aches, pains, cramps, or churning	CA #5, 8,11,12, 13, 17, 21, 22, 25, 26, 27, 28, 29, 31, 32, 33, 34, 35; OR #3, 4, 6, 8, 9, 10; WA #4, 9, 10, 11; OS #8, 13, 14, 15, 18, 22, 20, 21, 22, 23, 26, 28
Numbness in face or limbs	CA #6; OS #23
Skin irritation, burning, itching, peeling, rashes, hives, or bleeding sores	CA #3, 10,12, 16, 24, 27, 35; OR #8; WA #8, 10; OS #3, 8, 14, 20, 21
Salivation (excessive), drooling	WA #11; OS #18
Seizures	OS #15
Sore throat, throat swelling throat irritation or scratchiness hoarseness, loss of voice	CA #4, 8, 9, 10, 15, 17, 19, 23, 30, 31, 32, 35; OR #8, 13, 18, 20, 21; WA #4, 6, 10; OS #13, 14
Urination (frequent)	CA #26

* Acute symptoms and illnesses are short-term reactions to pesticide exposure. Chronic illnesses are long-lasting or recur frequently. Symptoms reported to state agencies in suspected pesticide exposure incidents tend to emphasize acute symptoms and illnesses rather than chronic illnesses.

In a number of exposure cases listed in Appendix A, symptoms were noted to have occurred, but details were not specified in the public records about the incidents that we were able to locate, and thus could not be included in this table.

- Pesticide exposures and illnesses can occur even when registered pesticide products are legally applied according to label directions. See Table 4-6 for a list of selected incidents from Appendix A where pesticides caused illness symptoms after legal applications.

- Solvents or other "inert" ingredients in pesticides can cause or contribute to illness symptoms. See incidents OS #18, 20, 28 in Appendix A. Inerts may also have played a role in incidents CA #13, OR #8, and others.

- Children and school staff have been exposed to pesticides at school via inhalation, dermal (skin) absorption or eye contact, and ingestion. See Table 4-7 for a key to exposure and illness cases in Appendix A associated with particular routes of exposure.

- Exposures to pesticides (and resulting illness symptoms) can occur many hours or even days after application, indoors or out, and with or without ventilation. In some cases, people were made ill after entering a school on Monday following pesticide applications made on Friday night. In other cases, exposure and/or illnesses occurred a week or longer after application. See Table 4-8 for a key to selected incidents in Appendix A where people were made ill days or weeks following pesticide applications.

- Even "spot treatments" or pesticides applied just to cracks and crevices, houseplants, outdoors, or under building structures can contaminate indoor air and surfaces, leading to exposure and illness of school children or staff. See Table 4-9 for a key to incidents in Appendix A involving various types of application methods.

- Some people are more sensitive, or have pre-existing conditions that make them more susceptible to harmful effects from pesticide exposures. People with asthma, ragweed or other allergies, bronchial or heart conditions, porphyria, or chemical sensitivities have reacted to pesticide exposures at school. They may be more likely than other people to experience adverse effects from pesticide exposures. People with suppressed immune systems from cancer treatments or other medical conditions may also be at greater risk of harm from pesticide exposures. See Table 4-10 for a key to selected incidents in Appendix A involving persons with sensitivities or pre-existing conditions that exacerbated their exposures.

- In many cases, pesticide exposure incidents occurred when schools were using pesticides in an effort to control pests such as dandelions, ants, or aphids. These organisms may be cosmetic or nuisance "pests," but, unlike the chemicals used in an effort to control them, they do not themselves pose threats to children's health. For examples, see the following incidents in Appendix A: CA #2 (weed spraying led to exposure of a first-grader and an asthma attack following the exposure); OR #3 (spraying for weeds resulted in nausea and headaches in 14 persons and evacuation of school); OR #8 (treatment for ants led to illness in 65 people, costly cleanup, and eventual closure of a school); WA #11 (treatment for aphids resulted in near-death of a second-grader); OS #6 (treatments for ants led to persistent headaches among children and school staff, and eventual relocation of a class); OS #17 (an herbicide linked to non-Hodgkins lymphoma in human and animal tests was used on a school lawn to control dandelions. A child at the school died of non-Hodgkins lymphoma).

- Pesticides are still being used by many school districts (or by individual teachers, custodians, or school nurses) in an effort to control head lice, despite long-standing federal agency recommendations against this practice. See the following incidents in Appendix A: OR #5; WA #9; OS #2, 16, 24, 27. The U.S. Centers for Disease Control, the EPA, and the National Pediculosis Association all recommend against using pesticides to spray surfaces or furnishings in rooms for head lice, saying the practice is not effective, and unnecesarily contaminates the indoor environment (Becher, 1992; Daar, 1997; NPA,1997).

- Pesticides are often not effective, and are used over and over again in school environments without successfully controlling pests. See the following incidents in Appendix A: OR #8 (many school rooms were sprayed for ants three times in a period of just over a month. The final application led to reports of illness in 65 people, and the closure of the school); OS #6 (repeated treatments for ants within a one month period led to persistent headaches among children and school staff, and eventual relocation of a class); OS #14 ("the flea infestation remained a problem even though copious amounts of pesticides had been used"); OS #20 (despite heavy use of chemicals, illness in many students, and evacuation and closure of school for a major cleanup of pesticide residues, roaches returned to the school before the students did); OS #28 (fleas were still present following a pesticide treatment that caused illness in many students and a school evacuation).

Table 4-5: Selected incidents in Appendix A involving illegal pesticide uses* (CA = California, ID = Idaho, MT = Montana, OR = Oregon, WA = Washington, OS = Other States subsections of Appendix A).

Category of violation	Incidents in Appendix A
Use or storage of banned or unregistered pesticide(s)	CA #5, 29; OR #2; OS #4, 14, 21, 27
Applications made by unlicensed applicators	OR #2; OS #1, 2, 5, 6, 13, 16, 21, 24, 25, 27
Negligent applications/creation of health hazard	CA #29; OR #8; WA #11; OS #24
Applications made in violation of label directions	CA #31; OR #1; WA #1, 11; OS #3, 7, 24, 27
Other or unspecified violations	CA #29, 35; OR #14, 15; OS #6, 7, 14, 18, 20, 24

* Other incidents listed in Appendix A may well have involved illegal pesticide applications. Information received about many of the cases, particularly those from California, did not specify whether illegal pesticide uses were involved, so we were unable to classify those cases here.

Table 4-6: Selected incidents in Appendix A where students or school staff experienced adverse health effects associated with legal pesticide applications* (e.g., those made with registered pesticide products used according to product label) (CA = California, ID = Idaho, MT = Montana, OR = Oregon, WA = Washington, OS = Other States subsections of Appendix A).

Pesticide(s) used	Symptom(s)	Incidents in Appendix A
glyphosate, 2,4-D, dicamba, MCPA	difficulty breathing sore throat, headache burning eyes, chemical sensitivity	CA #30
2,4,-D	unspecified symptoms	ID #3
2,4-D and triclopyr	unspecified symptoms	OR#2
chlorpyrifos	headache, nausea, respiratory problems, lightheadedness	OR #6
chlorpyrifos	unspecified symptoms	OR #13
chlorpyrifos	unspecified symptoms	OS #10
chlorpyrifos (and inerts)	headaches, nausea, stomach aches, breathing difficulties, dizziness	OS #28

* Other exposure and illnesss incidents listed in Appendix A may have resulted from legal pesticide applications. Information we received about many of the cases, particularly those from California, did not specify whether pesticides were applied according to label instructions or other laws, so we were unable to classify those cases.

Table 4-7: Selected exposure and illness cases in Appendix A associated with particular routes of exposure* (CA = California, ID = Idaho, MT = Montana, OR = Oregon, WA = Washington, OS = Other States subsections of Appendix A).

Routes of Exposure	Incidents in Appendix A
Oral/ingestion	CA #25; OR #6; WA #13; OS #7, 14
Dermal/skin or eye absorption	CA #12, 15, 20; WA #4, 8; OS #12, 14, 19, 20
Inhalation	CA #1, 3, 5, 9, 11, 12, 13, 14, 18, 20, 21, 25, 28, 30, 32, 33, 34; OR #3, 7, 8, 9,10,13,15; WA #5, 7, 9; OS #1, 3, 5, 6, 8, 9, 10, 11, 13, 14, 16, 17, 18, 19, 20, 21, 23, 26, 28
Multiple Routes of Exposure	CA #2, 12, 16, 20, 25, 30, 35; OS #6, 12, 14, 15, 20

* In some cases, routes of exposure were not specified, but have been surmised from reported circumstances.

Table 4-8: Selected incidents in Appendix A where people experienced adverse health effects from pesticides applied hours, days or weeks earlier (CA = California, ID = Idaho, MT = Montana, OR = Oregon, WA = Washington, OS = Other States subsections of Appendix A)

Timing of application relative to exposure	Incidents in Appendix A
Afternoon or evening before	CA #17, 24, 29; OS #10, 22, 28
Two to three days earlier (e.g., Friday night or over weekend before)	CA #4, 14, 20, 28, 32, 35; OR #13; WA #4, 5; OS #8
Five to seven days earlier (e.g., over a school break)	CA #16; OR #4; WA #10
More than a week earlier*	OR #6; WA #11

* The incidents listed here are cases where people became ill after first coming into contact with a pesticide that had been applied more than a week earlier. There are many other cases in Appendix A where persons experienced ongoing health problems that continued for more than a week following a pesticide application and exposure. These include: CA #12, 25, 26, 27; MT #1; OR #8; WA #4, 8, 10; OS #6, 15, 23.

Table 4-9: Types of pesticide applications that resulted in selected school exposure incidents listed in Appendix A (CA = California, ID = Idaho, MT = Montana, OR = Oregon, WA = Washington, OS = Other States subsections of Appendix A).

Treatment type	Incidents in Appendix A
Indoor applications	
Crack and crevice/baseboard treatment	CA #11, 19, 28, 29, 31; OR #8
"Spot" treatment	CA #11; OR #5, 8
Fogging/"bombing"	CA #25; WA #4, 9;
Automatic dispenser	CA #12
Wall void application	CA #6, 14; OR #1
Houseplant application	OS #13, 25
Greenhouse application	CA #5; OS #19
Unspecified/other indoor application	CA #4, 13, 15, 16, 17, 19, 20, 22, 24, 26, 32, 33; MT #1; OR #11, 15; WA #3; OS #1, 8, 9, 10, 14, 15, 16, 20
Structural applications To building foundations, crawl spaces, and exterior perimeters	CA #18, 27, 34; OR #6, 10, 13; OS #3, 21, 28
Outdoor applications	
Shrub beds, lawns, or exterior sites near building doors, air intakes	CA #9, 21, 23; OR #2, 3, 9; ID #2 (no illness alleged); WA #2 (no illness alleged), 6; OS #5, 11, 14, 16, 17
Athletic fields	CA #30; ID #3; OR #7; OS #12
Elsewhere/unspecified on grounds	CA #1, 2, 3, 10; OR #4; WA #11; OS #14, 18
Adjacent properties	CA #6, 8, 35; ID #5, 6

Table 4-10: Selected incidents in Appendix A involving persons with pre-existing conditions that exacerbated their exposures (CA = California, ID = Idaho, MT = Montana, OR = Oregon, WA = Washington, OS = Other States subsections of Appendix A)**.**

Pre-existing condition	Incidents in Appendix A
Allergies	CA #16, 19
Asthma	CA #2, 3, 20, 21; OS #8
Chemical sensitivity	CA #1, 26; MT #1; OS #9, 10
Chronic bronchial condition	CA #16
Immune system suppression due to chemotherapy treatment	OS #17
Porphyria	OR #4

- Sometimes school officials did not recognize (or only belatedly recognized) the association between pesticide exposure and ongoing or major adverse health effects in many people. In other cases, they only belatedly reported incidents to state agencies, precluding adequate investigations. See the following incidents in Appendix A: CA #12; OR #8; OS #15; OS #23. In some cases, school officials did not recognize likely symptoms of exposure. In other cases, they continued to deny any connection between pesticide use and illness symptoms, or failed to conduct an adequate investigation to rule it out, even after parents or teachers pointed out the possible or likely connection.

Learning From Our Mistakes

Clearly the use of pesticides has caused school districts and school boards around the country to learn the hard way about the hazards (and costs) of using toxic chemicals in school environments. Many children have been asked to learn the hard way, too, when pesticides used in their classrooms or on their playing fields have caused them to suffer headaches, nausea, sore throats, breathing difficulties, asthma attacks, or even more serious consequences.

It's time to learn from the many troublesome, and sometimes tragic, stories described in this report. There is an urgent need for stricter regulation of pesticides used in school settings, and for education of school administrators and school boards about the potential hazards of pesticides, even when they are applied legally and according to product labels.

The next chapter highlights steps that parents, teachers, school administrators, and state and federal policymakers need to take to prevent any more children from becoming unintended casualties of the overly casual use of intentional poisons in school environments.

Chapter 5
Recommendations for Parents, Schools, States and the Federal Government

Time for Change

The incidents and evidence summarized in this report show conclusively that children are exposed and are harmed when pesticides are used at school. Literally thousands of children and school staff have been sickened by exposure to these intentional poisons. Evidence described in this report also shows that school pesticide exposures have been linked to serious and life-threatening conditions such as acute poisoning, anaphylactic reactions, asthma attacks, and abnormal heart rhythms.

In addition, there is a growing base of scientific knowledge linking pesticide exposure to elevated risks of childhood cancers or permanent harm to the developing brain and nervous system. This knowledge provides further reason for concern, and impetus for action.

Given all the known and suspected risks of pesticide exposure to children, simple prudence and common sense should tell us that we cannot wait to act. There is an urgent need to reduce pesticide use (and potential for exposure) at school. Even one pesticide-linked cancer, or one pesticide-triggered asthma attack, or one learning disability or case of chemical sensitivity caused by pesticide exposure at school, can have devastating consequences for the affected child and his or her family. These are unconscionable risks to take with our children's health and lives.

School and health officials and government regulators have acted to ensure that children are not exposed to lead, asbestos, or cigarette smoke in school environments. It is time to take similar steps to ensure that children are not exposed to pesticides at school. The widespread and casual use of poisonous and cancer-causing substances where children spend so many hours learning and playing is simply unthinkable. Parents, school districts, and state and federal policymakers need to act now to prevent more children from being harmed.

Fortunately, there are many safer and more effective ways to control school pests than spraying toxic chemicals. To reduce children's exposure to pesticides in school settings, we recommend that parents, school districts, states, and the federal government take the following actions:

Parents:

1. Get Involved!: Work to ensure that your child's school district adopts policies based on the recommendations below, and that the policies are well-implemented. Serve on a policy implementation and oversight committee.

2. Exercise your Right to Know: Ask to see your school district's pesticide use records, and to be notified of any pesticide applications made at your child's school.

Schools and School Districts:

Adopt policies based on the following principles:

1. The Precautionary Principle: Recognize that any use of pesticides in a school environment poses risks, and that therefore minimizing or eliminating their use should be a formal and stated goal. Set up a process for periodic review of: a) all pesticide uses; b) non-chemical pest control alternatives; and c) progress toward meeting the pesticide minimization goal and continued pesticide use reduction.

2. Put Children's Health and Safety First: Consider use of pesticides ONLY if pests themselves present a health and safety hazard, not for "cosmetic" or "nuisance" pests (e.g., weeds or moisture ants). Never use pesticides for control of head lice in a school environment.

3. Eliminate the Most Hazardous Pesticides: Do not use a pesticide if animal testing, human exposure incidents, or other reliable evidence shows that the product or its constituent ingredients are:
   - highly or moderately acutely toxic;
   - pose environmental risks;
   - are known or suspected to cause cancer, or to damage the reproductive, nervous, immune or endocrine (hormone) systems; or
   - are known to aggravate allergies, asthma or chemical sensitivities.

Do not use pesticides unless all solvents and other "inert" ingredients are disclosed.

4. Use Even "Least-toxic" Pesticides Only as a Last Resort: Document the use of non-chemical pest prevention and control measures FIRST (e.g., sanitation, caulking), with pesticides considered only as a LAST RESORT. Use the smallest amounts of the "least-toxic" pesticides, and formulations with the least potential for human exposure (e.g., containerized baits, not sprays or dusts) if pesticides are used.

5. Involve the School Community: Make sure that teachers, students, parents, and all school district staff and contractors understand their roles in pest prevention (e.g., sanitation, head lice prevention, landscape design, increased tolerance for dandelions).

6. Honor the Public "Right to Know": Keep records of all pesticide use by school site and treatment location. Provide public access to the records, and to product labels and Material Safety Data Sheets (MSDSs). Provide at least 48-hour advance written and posted notification to all parents, school employees and students if pesticides are to be applied, with signs to remain posted for at least 72 hours, and preferably for 7 days, after application.

States:

1. Strengthen State Pesticide Laws. Adopt and enforce laws and regulations requiring that schools comply with the pesticide reduction and right to know provisions listed above under recommendations for schools and school districts. Do not register, or allow use of pesticide products for the control of head lice in school or home environments.

2. Promote Alternatives. Establish ongoing education and training programs for school districts to promote non-chemical pest control methods (e.g., for head lice, weeds). Provide incentives for schools to adopt non-chemical pest control methods.

Federal Government:

1. Strengthen Federal Pesticide Laws. Adopt and enforce laws and regulations requiring that schools comply with the pesticide reduction and right to know provisions listed above for schools and school districts. Do not register or allow use of pesticide products for the control of head lice in school or home environments.

2. Eliminate Use of the Most Hazardous Pesticides in School Environments. Require that the labels on any pesticides in the high hazard categories above (listed in #3 under the recommendations for schools and school districts) specify that they are not for use in school settings.

3. Require Full Disclosure of Pesticide Ingredients. Require that pesticide product labels list all ingredients, including so-called "inert" ingredients.

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Appendix A: List of School Pesticide Exposure Incidents

The following pages contain summary narratives describing 98 selected school pesticide exposure incidents that have occurred in the U.S. since 1986. The list is organized in reverse chronological order, from newest to oldest incidents, within the following subsections:

References are provided at the end of each summary. See Chapter 4 for an overview discussion of all the incidents, including summary tables and keys to incidents by state, type of application, chemical or symptoms involved, and more.

California

CDFA = California Department of Food and Agriculture
CPISP= California Pesticide Illness Surveillance Program

1. October 6, 1998. Orange County. A teacher in the Magnolia School District with a history of chemical sensitivity saw a school maintenance employee spraying glyphosate about seven yards away. She walked to within 10-20 feet of the applicator to ask him to stop the spraying. Almost immediately, she began to experience mild asthma, difficulty breathing, chest tightness and congestion. She felt no contact with the spray, but stated that she had been sensitive to chemicals for many years. The case was classified as "possible" exposure-related illness, partly due to the fact that she waited 20 days before visiting a doctor [CPISP Case # 98-1357].

2. March 30, 1998. Los Angeles. After dropping off her six-year-old son Nicholas at Sherman Oaks Elementary school, Robina Suwol watched as he approached the school through a cloud of mist being sprayed by a man in a white hazardous materials suit. The mist was so heavy that nearby drivers were using windshield wipers to clear their windows. One child was heard remarking "It tastes terrible." Concerned, Suwol contacted school staff, who could tell her nothing about the situation. She then contacted the school district and learned that a gardener had been applying the herbicide Princep (simazine). Later that night, Nicholas had an asthma attack that his mother believes was related to the exposure [1998. Parents Seeking Halt to Pesticide Use at Schools. *Los Angeles Times*, 6/6; 1999. District to Ban Insecticide, Weedkillers. *Los Angeles Times*, 3/24; Suwol, Robina. Pers. comm. 10/99 and 11/99].


Parents Seeking Halt to Pesticide Use at Schools

3. February 26, 1998. Exeter (Tulare County). A school teacher with a history of asthma developed sudden difficulty breathing and an itchy rash as she left her classroom and walked within five yards of an area being sprayed with glyphosate. Because she was prone to asthma attacks, she immediately sought medical attention. Her doctor thought she must have been directly exposed to spray drift in order to have developed the rash, but she did not believe she had been directly sprayed. Her case was classified as "possible" exposure-related illness [CPISP Case # 98-396].

4. June 8, 1998. Tracy (San Joaquin County). Four school staff members reported symptoms and sought medical attention when they returned to their school office three days following a treatment of the area with a ready-to-use roach spray containing pyrethrins, piperonyl butoxide, petroleum distillates, and undetermined other ingredients. Symptoms experienced by the employees included bronchitis, sore throat, congestion, difficulty breathing, and exacerbation of sinus problems, allergies, and rheumatoid arthritis. Three of the cases were classified as "probable" exposure-related illness, and the fourth was classified as "possible" [CPISP Case # 98-790 - 98-793].

5. November 13, 1997. Porterville. Five high school students experienced lightheadedness, nausea, headaches, and stomach pain after being exposed to pesticide fumes while replacing the school greenhouse roof. The source of the fumes was an application being made by another student for weed control under benches in the greenhouse below. The product being applied, Conquer (pentachlorophenol, tetrachlorophenol, prometon, undetermined other ingredients), was an old product no longer registered for use in the state. It had been donated to the school agriculture department. The students went to a hospital emergency room for evaluation. The cases were all classified as "probable" illness related to the pesticide exposure [CPISP Case # 97-1563 - 97-1567].

6. November, 1997. Watsonville. Air levels of the highly toxic pesticide methyl bromide up to ten times the state safety standard were measured on property adjacent to Salsipuedes Elementary School shortly after fumigation of nearby agriculture fields. Teachers and parents of students at Amesti Elementary School say strange ailments, including headaches, nosebleeds, facial numbness, and flu-like symtoms, plague the school each fall, at the time that nearby fields are being fumigated. More than 800 elementary schools or day care centers in California are located within a mile and a half of fields where methyl bromide is used [1997. Methyl bromide protesters picket Pajaro Valley school district offices. *Reporter*

Pajaronian, 11/18 ; 1997. Pesticide use near school causes furor. *Capital Press* (Salem, OR), 11/28; 1997. Are pesticides poisoning school kids? *San Francisco Examiner*, 11/16].

7. June 30, 1997. Fontana. Fifteen-year-old Chrissy Garavito collapsed and died after suffering a heart arrhythmia while playing softball at a city park. After ruling out other possibilities, an electrophysiologist consulted by the family now believes that exposure to pesticides, including those used at the park and at the girl's schools, is the only likely explanation for what could have triggered the heart rhythm disturbance that led to her death. While a middle school student, the girl had two incidents at school where she stopped breathing and suffered heart irregularities similar to the one that killed her. Certain nerve-poisoning pesticides are known to cause this type of heart irregularity. Pesticides, including organophosphates, synthetic pyrethroids, and herbicides, were regularly used at her school, at the park, and in the local environment. The school district agreed to pay a monetary settlement to the girl's family. Litigation is pending against the county and city [Platt, Dr. Mark (Loma Linda Univ. Medical Center). Pers. comm. 11/15/99 and 1/11/00; Matelko, Janine. Pers. comm. 11/16/99 - 1/26/00; Friedman, Michael. Pers. comm. 12/2/99; 1998. Pesticides. *Inland Valley Daily Bulletin* (Ontario), 2/9; Pesticide use records from Southridge Middle School and Fontana's Village Park from San Bernardino Dept. of Agriculture.]

Methyl bromide protesters picket Pajaro Valley school district offices

8. April 8, 1997. Alta Loma (San Bernardino County). An aide and twenty-three students developed stomach cramps, sore throats, coughing, and gagging and were examined at hospital emergency rooms after being exposed to odors of malathion applied an hour earlier at a neighboring apartment. Watering was thought to have released the odor. The state investigation classified all of the cases as "probable" illness linked to exposure to the malathion [CPISP Case # 97-772 - 97-795; Priority Case # 11-SBD-97].

9. April 10, 1997. Chula Vista (San Diego County). Two kindergarten teachers developed headaches, burning throats and itchy and watery eyes after an awning above the classroom door was sprayed for bees. A distinct odor permeated the classroom after the application was completed. The chemical applied contained allethrin, carbaryl, phenothrin, and other undetermined ingredients. The teachers stayed home the following day, and sought medical attention. Their cases were both classified as "probable" exposure-related illness [CPISP Case # 97-468, 97-469].

10. 1996. Los Angeles County. A teacher and his daughter developed headaches, dizziness, burning eyes and skin, coughing, sore throat and hoarseness after an application of the herbicide oxadiazon to a school campus. The cases were classified as "possible" exposure-related illnesses [CPISP Case #1996-1873 and 1996-1874].

11. 1996. San Luis Obispo County. Two instructional aides developed nausea, dizziness, headache, and shortness of breath after working in a school room while a pest control operator made spot and crack and crevice treatments with the insecticide propetamphos. Both workers sought medical attention, and their cases were classified as "probable" exposure and illness by the investigating state agency [CPISP Case #1996-785 and 1996-786].

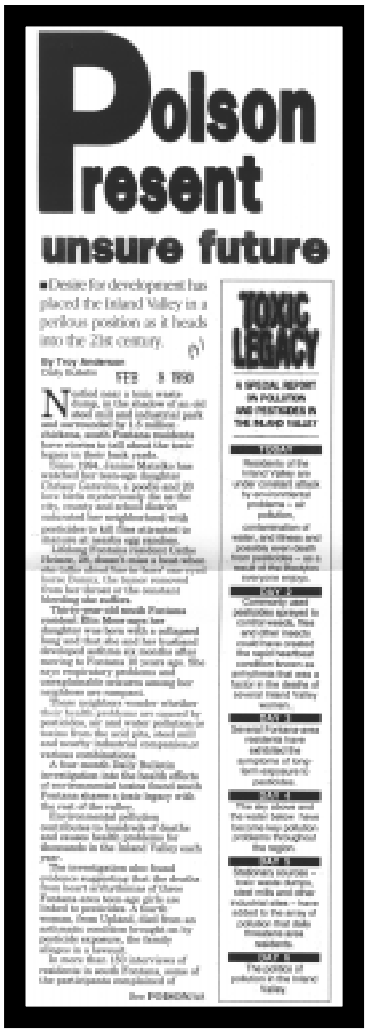
INLAND EMPIRE

Pesticide spraying at elementary school probed

Pesticide: School

12. 1994-1995. Fontana. Parents began to notice strange symptoms in their young children after they began attending school at Jurupa Hills Elementary School. One fifth-grader experienced fatigue and unbearable stomach pains, and was eventually hospitalized. She missed months of school due to her illnesses. A kindergartner suffered bleeding blisters on his head and hair loss when

he started attending the school. Another kindergartner suffered rashes and blisters on parts of his body that came into contact with classroom surfaces. This boy also developed a smoker-like cough, diarrhea, stomach pains, and shortness of breath. Other children also developed asthma-like symptoms.


Poison Present
unsure future
TOXIC LEGACY

Doctors were intially baffled by the children's symptoms. Concerned parents finally learned that the school had recently installed automatic pesticide dispensers in classrooms. The dispensers sent a mist of the insecticide Purge III (pyrethrins, piperonyl butoxide) into classroom air every 15 minutes. The day after a dispenser was installed in one classroom, the teacher returned to find that silkworms that she had been rearing for a class project had all died.

Pyrethrins, the active ingredient of the pesticide used in the automatic dispensers, can be readily absorbed via inhalation. Symptoms of over-exposure include contact dermatitis, allergic respiratory reactions such as rhinitis (inflammation of mucous membranes in the nose) and asthma, and some irritant or sensitizing reactions. The Material Safety Data Sheet (MSDS) for Purge III states that symptoms and signs of exposure include headaches, nausea, vomiting, abdominal cramps, and dermatitis.

Purge III also contains 1,1,1-trichloroethane and other "inert" ingredients at much higher levels than the active ingredients. Breathing high levels of trichloroethane can cause dizziness and lightheadness. Inhalation of trichloroethane has been correlated with damage to breathing passages and nervous system effects in animal studies. Dermal exposure has been associated with skin irritation.

While school district officials at first denied any possibility that the children's symptoms were being caused by exposure to the insecticide, they discontinued use of the automatic dispensers. Lengthy and expensive litigation followed, as various families sued either the school district or the pest control company that serviced the dispensers. Doctors consulted by one family that is still in litigation have concluded that their son's symptoms are consistent with exposure to the pesticide, and that the boy was exposed to a dose sufficient to cause the symptoms. The doctors also note that the boy's symptoms cleared up when he was removed from the school [Matelko, Janine. Pers. comm. 12/99; Friedman, Michael. Pers. comm. 12/99-1/00; Hixson, Lorena. Pers. comm. 1/12/00; San Bernardino County Department of Agriculture, Pesticide Episode Investigation Report, 3/28/95; 1998. Pesticides. *Inland Valley Daily Bulletin* (Ontario), 2/9; 1998. Lethal consequences. *Inland Valley Daily Bulletin*, 2/10; 1993. US Public Health Service *Toxicological Profile for 1,1,1-Trichloroethane*, Update (Oct.); 1999. EPA *Recognition and Management of Pesticide Poisonings*; 1990. MSDS, Purge III Insect Killer, Waterbury Companies, Inc. (8/1)].

13. 1995. Richmond. An employee of the Richmond Unified School District experienced nausea, headache, dizziness, and chest pain after returning to her work area a few minutes after a pest control operator applied the insecticide cyfluthrin nearby. This case was classified as "probable" exposure and illness by the investigating state agency [CPISP Case # 95-297].

14. 1995. Los Angeles. A teacher in a Los Angeles school noticed a strong odor and suffered respiratory problems after entering a classroom two days following application of chlorpyrifos as a termiticide into holes drilled inside of classroom walls. The case was classified as "possible" exposure-related illness [CPISP # 95-502].

15. 1995. Los Angeles. One teacher experienced throat swelling and lightheadness when she entered a classroom two hours after another employee had sprayed the classroom with the insecticide chlorpyrifos. The case was classified as "probable" exposure and illness by the investigating state agency [CPISP Case # 95-551].

16. April 17, 1995. Ontario-Montclair/San Bernardino County. One teacher with a chronic bronchial condition had a severe allergic reaction, including rash and difficulty breathing, when she entered a classroom that had been treated 5 days earlier (over spring break) with a pyrethrin-containing insecticide. The case was classified as "probable" exposure and illness [CPISP Case # 95-626].

17. 1995. Contra Costa County. Four school staff members developed symptoms when they arrived for work in the morning following flea spraying in their school by a pesticide control operator the afternoon before with methoprene, propetamphos and another undetermined pesticide. Symptoms ranged from nausea, stomach cramps, headache, and dizziness to red, burning eyes, and throat irritation. The investigating state agency classified the case as "probable" exposure and illness [CPISP Case # 95-873, 95-970, 95-1800 and 95-1801].

18. 1995. Santa Barbara County. A maintenance worker detected an odor and became weak and dizzy an hour after entering a room following a perimeter treatment on the outside of the building with the insecticide chlorpyrifos [CPISP Case # 95-1593].

Bugged by pesticide spraying

Woman takes son out of school to avoid chemical

19. 1994. Los Angeles County. A principal with a history of allergies developed nasal congestion and a scratchy throat after returning to her office a few hours after a worker applied an allethrin-containing insecticide a few feet from her desk. The CPISP classified her case as "probable" exposure and illness [CPISP Case # 94-576].

20. 1994. Sonoma County. A teacher with a history of asthma noticed a residue in her classroom upon entering it three days following treatment with a pyrethrin-containing insecticide. She cleaned the classroom with a disinfectant, and suffered an asthma attack (wheezing, tightness in her chest). CPISP classified her case as "probable" exposure and illness [CPISP Case # 94-782].

21. 1994. San Diego County. An asthmatic student developed headache, dizziness, abdominal cramps, and drowsiness after a school groundskeeper treated wasp nests in school air conditioning units with a resmethrin-containing insecticide. An odor was noted in the classroom, but other students were not affected. The case was classified as "probable" exposure-related illness [CPISP Case # 94-836].

22. 1994. Riverside County. Following an aerosol application of the insecticide propoxur, the odor of the chemical was distributed throughout a school building by the air conditioning system. A teacher's aide entered the building immediately afterwards and became nauseous and experienced difficulty breathing. The aide also developed a headache and eye and nose irritation. The case was classified as "probable" exposure and illness [CPISP Case # 94-97].

23. 1993. San Bernardino County. A teacher was sprayed with the insecticide cypermethrin by a pest control operator who was treating the door frame as she stepped out of her classroom. She immediately rinsed her skin, but developed a headache and throat irritation a short time later. Her case was classified as "probable" exposure and illness [CPISP Case # 93-1723].

24. 1993. San Bernardino County. A school kitchen was treated for roaches at night with a combination of chemicals including acephate, bendiocarb, boric acid, chlorpyrifos, and pyrethrins. The next morning, three kitchen workers developed symptoms after cleaning counters, pots and pans. One person experienced a rash over his or her entire body. A second developed puffy, itchy eyelids, and a third experienced swelling of eyelids and conjuctivitis of the eye. The cases were classified as "possible" exposure-related illness [CPISP Case # 93-1795, 1796, 1797].

25. 1993. Orange County. An employee entered a school office shortly after the reentry interval had expired following treatment with an insecticide fogger containing fenvalerate and pyrethrins. She developed diarrhea, cramps, and a headache after spending about 2 hours in the building and drinking from a cup that had been in the room during the fogging. Her symptoms persisted for three to four weeks. The case was classified as "possible" exposure-related illness [CPISP Case # 93-1172].

26. Fall 1992. Canyon Country. Kindergartener Kenny Tye began having headaches, stomach problems, frequent urination, and was generally sick and tired all the time after starting school at Mitchell Elementary School. His mother, Theresa, began to suspect possible pesticide poisoning when she noted that her son's symptoms were similar to those he had experienced following an earlier pesticide misapplication at the family's home. She also noticed that his symptoms worsened toward the end of

each month. Upon investigating, she learned that the school was making routine applications of Dursban (chlorpyrifos), diazinon, Ficam (bendiocarb), and other pesticides on the fourth Friday of each month. A neurotoxicologist consulted by the family at this time confirmed that the boy's symptoms were likely caused by the pesticides and stressed the importance of avoiding future exposures. In fact, the doctor recommended that the boy not attend any school that had ever been treated with insecticides. After the school was sprayed over Christmas break, Theresa took this advice and removed her son from school. His symptoms disappeared [Tye, Theresa. Pers. comm. 6/93, 1/00; 1993. Bugged by pesticide spraying. *The Signal and Saugus Enterprise* (Canyon Country), 1/7; 1993. Letter to parents from Sulphur Springs superintendent, 1/13].


Cutten parents want answers

School officials are asked to explain chemicals suspected of ailing children

27. Fall, 1992. Humboldt County. Just days before school started in September, 1,500 gallons of insecticide solution containing Dursban TC (chlorpyrifos) were injected into thousands of holes drilled into the cement slab foundation under Cutten Elementary School in an effort to control termites. A teacher began experiencing "flu-like" symptoms (headache, tightness in her chest, disorientation, nausea), but also eye irritation and swelling of her face upon returning to her classroom following the treatment. This teacher also reported that similar symptoms were occurring in her students. She filed a worker's compensation claim a month later, stating that she believed her illness was related to workplace exposure to the pesticide. Her doctor agreed that her symptoms were compatible with exposure to the chemical. Testing done in December found chlorpyrifos in the air of her classroom, albeit at low levels.

Parents did not learn about the pesticide application until spring break in April, when they began comparing notes about their childrens' illnesses, and learned about the pesticide application from the teacher. At that time, an informal health survey was circulated by parents. Thirty-seven parents reported that their children had experienced symptoms including headaches, stomach cramping, skin rashes, fatigue, hair loss (one child lost half her hair), and other symptoms after returning to school in the fall. A doctor who reviewed these surveys noted that symptoms reported were compatible with chlorpyrifos poisoning. Surface testing of classroom floors in May, eight months (and numerous floor washings) after the pesticide application, showed that chlorpyrifos was still present in 10 of 14 samples, though school officials said the levels were "within normal and acceptable health limits." Airborne asbestos was also found in classroom air, due to the fact that the pest control contractor had drilled through asbestos floor tiles when making the termiticide application [1993. Cutten parents want answers. *Times-Standard* (Eureka), 7/10; 1993. News release from Concerned Cutten Parents, 7/8; 1993. Cutten Elementary School expanded sampling. SHN Consulting Engineers and Geologists (Eureka), June; 1993. Memo from Michael O'Malley to James Wells, Activities involving the Cutten Elementary School in Eureka. CA Dept. of Pesticide Regulation, 5/7; 1993. Inquiry about chlorpyrifos exposure at school. Note to John Donahue and Mike O'Malley from Dennis Gibbons. CA Dept. of Pesticide Regulation, 4/8].

28. 1992. San Bernardino County. A teacher's aide became dizzy and experienced nausea and vomiting after arriving at school on Monday morning following a Friday evening application of the insecticide bendiocarb to cracks and crevices in school classrooms. Her case was classified as "probable" exposure and illness [CPISP Case # 92-1210].

29. October 8, 1991. San Bernardino, California. Arriving employees noted a strong odor and left all the doors open in an attempt to ventilate Mt. Vernon Elementary School the morning after a pesticide application had been made in an effort to control cockroaches. The spraying was done by school custodians, who used RAK-5 (diazinon, pyrethrins) inside and outside the school, including along baseboards in all the classrooms. Within an hour of classes starting, teachers and students began to experience nausea, headaches, and vomiting. One teacher's aide fainted upon entering the school, and two others went to the hospital emergency room with headaches, nausea, dizziness, and vomiting. A total of twenty-seven school employees complained of symptoms. The fire department was called and the school was evacuated. Hazardous materials team members reported seeing a puddle of pesticide on the floor of the kindergarten room.

The incident was not reported to the San Bernardino Agriculture Dept., which instead learned of it from reading a newspaper account. The agency conducted an investigation, and determined that RAK-5 was not registered for use in California. The agency also collected swab samples from the school kitchen the next day. The samples tested positive for diazinon and pyrethrins. Chlorpyrifos, another organophosphate pesticide, was found at much higher levels. This pesticide was last used in the kitchen by the school's commercial applicator two months earlier. The school district was cited for multiple violations of state pesticide law, including possession and use of unregistered products, creation of a health hazard, and violation of worker safety regulations [CPISP Priority Investigation # 53-SBD-91].


Overwhelming odor

Fumes from insecticide force 675 students outside of school

30. April 17, 1991. El Cajon, California. On a Wednesday morning, Roundup (glyphosate) was applied to the school grounds at El Cajon Valley Jr. High School and to an adjacent park, and Trimec (2,4-D, dicamba, MCPA, undetermined other ingredients) was simultaneously applied in the park for weed control. To the surprise of the crews spraying in the park, children from the school were released early for the day, and began to take their usual short-cuts through newly-sprayed park areas. The next day, PE classes were held on the treated area at the school. Within a half hour of being on the field, one PE teacher developed a sore throat, chest pain and difficulty breathing, and reported that several students also complained of sore throats. A second PE teacher reported a headache and burning chest. A third PE teacher developed a headache and scratchy throat later that evening after taking classes onto the field. His symptoms worsened over several days.

In addition to the PE teachers, an outdoor custodian and two others who worked in portables or classrooms near the spraying reported illnesses including burning eyes, difficulty breathing, sore throat, headache, shortness of breath, and blurry vision the day following the applications. Some individuals reported that symptoms lasted for days or weeks. Doctors consulted by several of the affected individuals stated that respiratory and eye symptoms were likely caused by the chemical exposure. The custodian reported developing chemical sensitivity as a result of the incident. Ironically, one of the school's other PE teachers was already known to be very sensitive to chemicals, and the spraying of the PE fields had been scheduled for a day when that teacher was not at school. The state found no violations of pesticide law [CPISP Priority Investigation # 21-SD-91].

31. 1987. Los Angeles, California. A school cafeteria supervisor ordered an employee to spray a central kitchen facility in an effort to control cockroaches. The employee purchased and applied Enforcer Roach Rid (boric acid) to cracks and crevices, under sinks and counter tops, and around the baseboards in the food preparation area of the kitchen. The next morning, kitchen workers entered and turned on bakery fans. The boric acid became airborne and was dispersed around the work area. Twelve exposed employees sought medical attention, with symptoms of sore throat, headache, nausea, loss of voice, burning eyes, and more. All twelve of the cases were classified by the investigating state agency as "definite" exposure-related illness. The school district was fined $200 for using the boric acid contrary to label instructions. The label stated that the product was not to be used in edible product areas where food is prepared or processed [Richmond, Don (CA Dept. of Pesticide Regulation). Pers. comm. 1/20/00; CPISP Case # 87-380-388 and 87-652-654; CPISP Priority Case # 20-LA-87].

32. 1986. Unspecified school. On a Friday, an application of chlorpyrifos and DDVP (dichlorvos) was made to an unidentified California school for spider control. The next Monday, a very strong odor was present in all classrooms, and many other rooms. Within two hours, twenty-nine students complained of headaches, sore throats, dizziness, and nausea. One teacher fainted and an additional eight employees were seen by physicians. The school was later evacuated [1988. Maddy, K and S. Edmiston. Selected incidents of illnesses and injuries related to exposure to pesticides reported by physicians in California in 1986. CDFA].

33. 1986. Unspecified school. An employee of an unidentified California school district applied chlorpyrifos (low odor formulation) to some classrooms. No

ventilation was provided. Teachers and students entered the classroom one hour later. Sixteen students and teachers went for medical care with symptoms of headaches, nausea, dizziness, diarrhea, and vomiting. Ten others reportedly experienced symptoms but did not receive medical care [1988. Maddy, K and S. Edmiston. Selected incidents of illnesses and injuries related to exposure to pesticides reported by physicians in California in 1986. CDFA].

34. 1986. Unspecified schools. Seven teacher's aides and nine students experienced headaches, eye irritation, nausea, stomach pain and dizziness after malathion was applied to the exterior of buildings in two unidentified California schools. The applications were made by a commercial pest control operator while classroom windows were open. Eighty-five students and nine teachers were taken to a hospital emergency room for exams and treatment [1988. Maddy, K and S. Edmiston. Selected incidents of illnesses and injuries related to exposure to pesticides reported by physicians in California in 1986. CDFA].


INLAND Empire

Students evacuated from classrooms

35. 1986. Unspecified school. Parathion was applied to a vineyard which bordered a California school yard. Three days later, thirteen school employees and thirty-six students complained of various symptoms, including respiratory discomfort, nausea, headaches, tiredness, throat irritation, dizziness and skin irritation. Eleven students sought medical care. This application was made in violation of local use permit conditions, which stated that applications were not to be made while school was in session [1988. Maddy, K and S. Edmiston. Selected incidents of illnesses and injuries related to exposure to pesticides reported by physicians in California in 1986. CDFA].

Idaho

IDA = Idaho Department of Agriculture

1. August, 1997-January, 1998. Gem County and Emmett. An unlicensed applicator applied herbicides on several school grounds [IDA Case # 98065].

2. July 20, 1995. Meridian. A commercial lawn service sprayed the lawn at Centennial High School while approximately one hundred students were on the site. Chemicals used were carbaryl and Hat Trick (MCPA, MCPP, dicamba). Warning signs were posted only after spraying was done. Investigators concluded that while the application may not have been good business practice, it was not in violation of any Idaho pesticide laws [IDA Case # 96026].

3. May 1, 1995. Nampa. One child went to a doctor, and others complained of illness following application of 2,4-D-containing weed killer to the school yard at Montgomery Jr. High School. According to IDA, the pesticide was applied according to label directions [IDA Case # 95060].

4. February 9, 1995. Boise. A woman observed an Orkin applicator spraying doorways and play areas at the Broadway Park Montessori Preschool. When she complained, expressing concern for her grandaughter's safety, she was told that the applicator was not doing pest control. IDA investigators concluded that pesticides, including Dursban (chlorpyrifos), Tempo 20WP (cyfluthrin), and PT 280 (acephate), were applied, but that applications were made according to label instructions [IDA Case # 95027].


Spraying in schools

Some claim pesticides are dangerous; district willing to discuss issue

Two women say spraying has affected them...
Page 8A

5. May 27, 1994. Rexburg. A school employee reported an aerial application of an unknown chemical near or over Hibbard Elementary School. Students and teachers reportedly experienced headaches [IDA Case # 94056].

6. May 18, 1992. Castleford/Twin Falls County. The Superintendent called to report a strong odor of pesticides present in the school and to express his concern for the health of his students and staff. An aerial application of the potent insecticide Disyston (disulfoton) had been made to a barley field near the school in 10 mph winds, and wind direction was toward the school, according to the principal. The IDA inspector found no violations [IDA Case # 92070].

7. September 6, 1991. Idaho Falls. A mother called to complain of the smell from a 2,4-D and dicamba application to an elementary school soccer field. She and her husband saw the application occurring in windy conditions during the afternoon, and noted that children were allowed to enter the area just an hour after the application. Their own children were exposed when they went to play soccer early that evening [IDA Case # 91221].

8. August 26, 1991. Emmett. A resident reported direct aerial application of malathion to approximately 8 children waiting for a school bus. The spraying was done by a county mosquito abatement district [IDA Case # 91202].

Montana

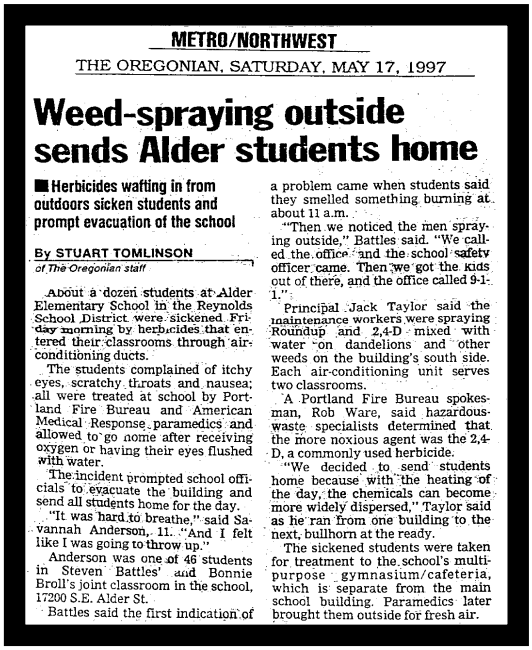
1. Fall, 1995. Helena. A teacher and an aide, both chemically sensitive, believe that pesticides used by the school district contributed to illnesses they experienced when returning to work in the fall. The womens' symptoms included exhaustion, achiness, and loss of ability to concentrate. The district maintenance officer confirmed that pesticides, including Dursban (chlorpyrifos), were being used monthly in the district's high schools and middle schools, and quarterly in elementary schools [1996. Women say spraying hurt health. *Independent Record* (Helena), 1/21; 1996. Spraying in schools. *Independent Record* (Helena), 1/21].

Oregon

PARC = Oregon Pesticide Analytical and Response Center
ODA = Oregon Department of Agriculture

1. September 11, 1998. Albany. Three adults reported symptoms while working in a school near where the insecticide malathion was being applied by a district maintenance worker to a wall-void during school hours. The application was made to an area between a vacant classroom and an occupied day care center. There was a delay of six days before the school district reported the incident to the state. The school district and the maintenance worker were cited for applying a pesticide in a manner inconsistent with its label. The product was labeled for outdoor use only, but was applied indoors in an effort to control yellowjackets [PARC Case # 98-045].

2. July 25, 1997. Marion County. At least one person reported symptoms after a school district maintenance worker applied the weed-killer Crossbow (triclopyr and 2,4-D) to a school ground. The chemical was applied near an air intake during school operating hours. State investigators found "serious" chemical material handling, storage, and disposal problems at the school, including improper storage of 21 old, suspended, or restricted use pesticides. The school district was cited for multiple violations, including lack of recordkeeping on hazardous materials, and engaging in pesticide application without a valid applicator's license [PARC Case # 97-048].



METRO/NORTHWEST

THE OREGONIAN, SATURDAY, MAY 17, 1997

Weed-spraying outside sends Alder students home

Herbicides wafting in from outdoors sicken students and prompt evacuation of the school

By STUART TOMLINSON
of The Oregonian staff

About a dozen students at Alder Elementary School in the Reynolds School District were sickened Friday morning by herbicides that entered their classrooms through air-conditioning ducts.

The students complained of itchy eyes, scratchy throats and nausea; all were treated at school by Portland Fire Bureau and American Medical Response paramedics and allowed to go home after receiving oxygen or having their eyes flushed with water.

The incident prompted school officials to evacuate the building and send all students home for the day.

"It was hard to breathe," said Savannah Anderson, 11. "And I felt like I was going to throw up."

Anderson was one of 46 students in Steven Battles' and Bonnie Broll's joint classroom in the school, 17200 S.E. Alder St.

Battles said the first indication of a problem came when students said they smelled something burning at about 11 a.m.

"Then we noticed the men spraying outside," Battles said. "We called the office and the school safety officer came. Then we got the kids out of there, and the office called 9-1-1."

Principal Jack Taylor said the maintenance workers were spraying Roundup and 2,4-D mixed with water on dandelions and other weeds on the building's south side. Each air-conditioning unit serves two classrooms.

A Portland Fire Bureau spokesman, Rob Ware, said hazardous-waste specialists determined that the more noxious agent was the 2,4-D, a commonly used herbicide.

"We decided to send students home because with the heating of the day, the chemicals can become more widely dispersed," Taylor said as he ran from one building to the next, bullhorn at the ready.

The sickened students were taken for treatment to the school's multipurpose gymnasium/cafeteria, which is separate from the main school building. Paramedics later brought them outside for fresh air.

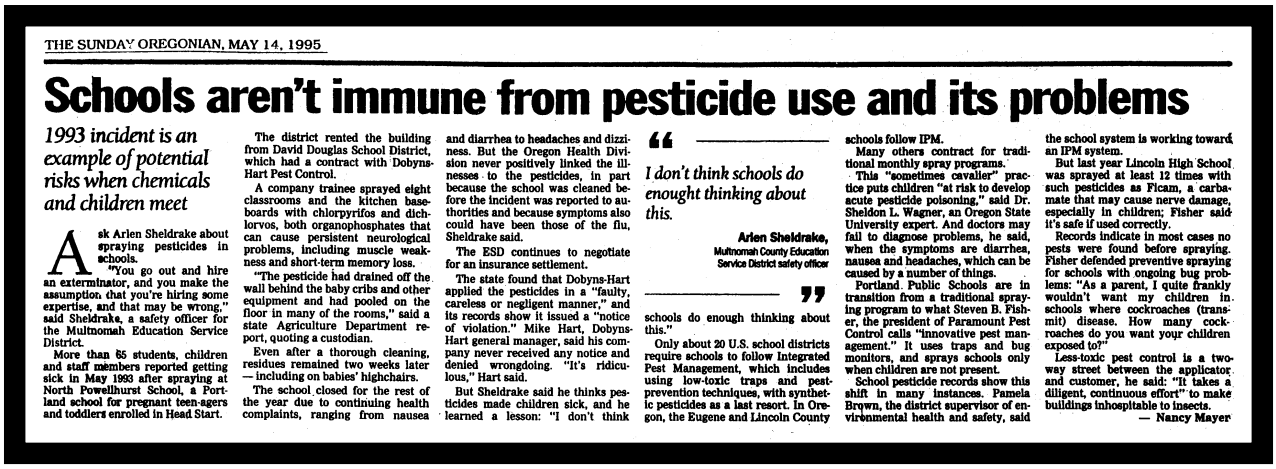
3. May 16, 1997. Portland. Twelve students and staff members at Alder Elementary experienced nausea and headaches and were treated by paramedics after breathing herbicide fumes that entered classrooms via air intake vents. A mixture of the pesticides 2,4-D and Roundup (glyphosate) was being applied outdoors for weed control while school was in session. The school was evacuated and all students sent home for the day [1997. Weed-spraying outside sends Alder students home. *The Oregonian* (Portland), 5/17; PARC Case # 97-020].

4. March 25-29, 1996. Coos Bay. A school bus driver reported symptoms after returning to work on Monday, April 1, 1996, after school district maintenance personnel had sprayed the perimeter of the bus parking area with Roundup (glyphosate) over spring break. Her physicians believe that she has a pre-existing condition, porphyria, that made her susceptible to chemical exposures, and that she has developed chemical sensitivity triggered by the combined exposure to the Roundup, cigarette smoke, and gasoline fumes at work. Though the employee filed a worker's compensation claim, the incident was not reported to the state pesticide incident tracking system [Johnson, Gail. Pers. comm. 5/8/97 and 10/99; Thompsen, Catherine (PARC). Pers. comm. 1/00].

5. November 13, 1995. Lane County. A child developed continuing health problems after returning to his elementary school in the fall, and his family suspected his symptoms were due to exposure to a pyrethrin-containing pesticide used at the school in an attempt to control head lice. Investigation showed that the school was applying the chemical to classroom coat racks, "cubbies" and desks of children with head lice. The child's symptoms were consistent with symptoms of exposure to pyrethrins. The case was classified as "possible" exposure and illness due to lack of information or testing needed to confirm pesticide exposure [PARC Case # 95-062; Pers. comm., Catherine Thomsen, PARC (1/00)].

6. September 6, 1994. Grant County. Five adults reported headaches, upper respiratory problems, nausea, and lightheadedness after returning to classrooms in September. Sections under the school had been treated with Dursban TC (chlorpyrifos) in July an effort to control termites. ODA found no violations, though the school experienced continuing indoor air quality problems into 1995 [PARC Case # 94-051].

7. October 25, 1993. Jackson County. A coach stopped a soccer game after noticing granules in the turf. One parent reported that a young child played with the granules and then put his fingers in his mouth. At least one child that played soccer developed symptoms that night,



THE SUNDAY OREGONIAN, MAY 14, 1995

Schools aren't immune from pesticide use and its problems

1993 incident is an example of potential risks when chemicals and children meet

Ask Arlen Sheldrake about spraying pesticides in schools.

"You go out and hire an exterminator, and you make the assumption that you're hiring some expertise, and that may be wrong," said Sheldrake, a safety officer for the Multnomah Education Service District.

More than 65 students, children and staff members reported getting sick in May 1993 after spraying at North Powellhurst School, a Portland school for pregnant teen-agers and toddlers enrolled in Head Start.

The district rented the building from David Douglas School District, which had a contract with Dobyns-Hart Pest Control.

A company trainee sprayed eight classrooms and the kitchen baseboards with chlorpyrifos and dichlorvos, both organophosphates that can cause persistent neurological problems, including muscle weakness and short-term memory loss.

"The pesticide had drained off the wall behind the baby cribs and other equipment and had pooled on the floor in many of the rooms," said a state Agriculture Department report, quoting a custodian.

Even after a thorough cleaning, residues remained two weeks later — including on babies' highchairs.

The school closed for the rest of the year due to continuing health complaints, ranging from nausea and diarrhea to headaches and dizziness. But the Oregon Health Division never positively linked the illnesses to the pesticides, in part because the school was cleaned before the incident was reported to authorities and because symptoms also could have been those of the flu, Sheldrake said.

The ESD continues to negotiate for an insurance settlement.

The state found that Dobyns-Hart applied the pesticides in a "faulty, careless or negligent manner," and its records show it issued a "notice of violation." Mike Hart, Dobyns-Hart general manager, said his company never received any notice and denied wrongdoing. "It's ridiculous," Hart said.

But Sheldrake said he thinks pesticides made children sick, and he learned a lesson: "I don't think schools do enough thinking about this."

> *"I don't think schools do enought thinking about this."*
>
> **Arlen Sheldrake,**
> Multnomah County Education Service District safety officer

Only about 20 U.S. school districts require schools to follow Integrated Pest Management, which includes using low-toxic traps and pest-prevention techniques, with synthetic pesticides as a last resort. In Oregon, the Eugene and Lincoln County schools follow IPM.

Many others contract for traditional monthly spray programs.

This "sometimes cavalier" practice puts children "at risk to develop acute pesticide poisoning," said Dr. Sheldon L. Wagner, an Oregon State University expert. And doctors may fail to diagnose problems, he said, when the symptoms are diarrhea, nausea and headaches, which can be caused by a number of things.

Portland Public Schools are in transition from a traditional spraying program to what Steven B. Fisher, the president of Paramount Pest Control calls "innovative pest management." It uses traps and bug monitors, and sprays schools only when children are not present.

School pesticide records show this shift in many instances. Pamela Brown, the district supervisor of environmental health and safety, said the school system is working toward an IPM system.

But last year Lincoln High School was sprayed at least 12 times with such pesticides as Ficam, a carbamate that may cause nerve damage, especially in children; Fisher said it's safe if used correctly.

Records indicate in most cases no pests were found before spraying. Fisher defended preventive spraying for schools with ongoing bug problems: "As a parent, I quite frankly wouldn't want my children in schools where cockroaches (transmit) disease. How many cockroaches do you want your children exposed to?"

Less-toxic pest control is a two-way street between the applicator and customer, he said: "It takes a diligent, continuous effort" to make buildings inhospitable to insects.

— Nancy Mayer

and six people experienced symptoms overall. It was later determined that Triamine Weed and Feed (2,4-D, 2,4-DP, MCPP) had been applied to the field five days earlier. At least one other soccer game had occurred the day after the application. State investigators classified one case as "suspect" exposure, but found no label violations [PARC Case # 93-080].

8. May 6, 1993. Portland. At least sixty-five individuals, including infants, children, pregnant teenagers, teachers and school staff reported nausea, vomiting, diarrhea, massive headaches, rashes, dizziness, itching eyes, sore throats and other symptoms upon returning to North Powellhurst School following a treatment with the pesticide Di-Tox E (chlorpyrifos, dichlorvos) for ant control. The school staff member who was the first to re-enter the building following the treatment described the odor from the pesticide application as being overpowering, and like nothing he had experienced since being exposed to tear gas in the military. Symptoms of overexposure to organophosphate pesticides such as chlorpyrifos and diclorvos include headache, nausea, diarrhea, and tearing of the eyes. The pesticide product applied in this case also contained over 70% xylene. Symptoms of exposure to high levels of xylene include irritation of the skin, eyes, nose, and throat, difficulty breathing, stomach discomfort, headaches and dizziness.

The incident was reported to the state only weeks after it occurred. The school was closed and cleaned, but pesticide residues were still found two weeks later on a baby high chair and a classrom baseboard. The school was eventually closed early for the year when students and staff reported continuing health problems. The safety officer for the educational services district believes that pesticide exposure was the cause of the illnesses. State investigators classified one case as "probable" and 3 cases as "suspect" exposure and illness. Tests that could have detected pesticide exposure in humans were not undertaken for most of the people reporting symptoms. The state Health Division noted that it was not possible to do a complete investigation because the agency was contacted so late, and the school had been cleaned prior to pesticide testing. The pest control operator was cited for applying pesticides in a negligent manner. The educational services district incurred substantial costs to clean the facility and replace furniture and carpets [Walls, Darrell. Pers. comm. 11/24/93; Multnomah County Health Dept. Notes on Initial Patient Encounter, 5/20/93-6/1/93; PARC Case # 93-035; 1995. Schools Aren't Immune from Pesticide Use and Its Problems. *The Oregonian* (Portland), 5/14; Thomsen, Catherine (PARC). Pers. comm. 1/8/00; 1993. US Public Health Service, *Toxicological Profile for Xylene*s (Oct.); 1995. US Public Health Service, *Toxicological Profile for Dichlorvos* (August); 1999. US EPA *Recognition and Management of Pesticide Poisonings*].

9. April 24, 1992. Josephine County. One teacher and approximately five students at Lincoln Savage Middle School complained of nausea and were sent home, and approximately 90 children were potentially exposed, following application of diesel fuel as an herbicide outside three portable classrooms the previous afternoon. PARC classified the cases as "possible" exposure and illness. The school had no licensed applicators on staff, and had been using diesel as a weed killer for many years. An ODA investigator logged the complaint, but no investigation was undertaken [PARC Case # 92-042].

10. October 7, 1991. Noti. A teacher and students complained of odor, headaches, dizziness and nausea when they returned two days following structural application of the insecticides Dursban (chlorpyrifos) and Tempo 20WP (cyfluthrin) to the walls and foundation of their elementary school classroom. Over 100 gallons of pesti-

cide solution had been injected into holes drilled into wooden walls, asbestos floor tile, and soil and asphalt around the perimeter of the room in an effort to control carpenter ants. Air samples showed no detectable residues of the chemicals, though the samples were collected over a week after the application, and following cleaning and ventilation of the room. The state found no violations of pesticide application laws. Three cases were classified as "suspect" exposure and illness [PARC Case # 91-055; ODA Case # 92-1012 and 1013].

11. April 2, 1990. Unspecified school. Teachers reported concerns following a safrotin (propetamphos) application. One teacher who had symptoms saw a physician. PARC classified the case as "probable exposure/illness" [PARC Case #90-023].

12. April 26, 1989. Portland. Seven of twelve T-ball players experienced illness following a Little League game at Beach Elementary School. Bees in the outfield that had generated complaints the previous week were no longer present, leading some parents to suspect an insecticide application. The school denied that an application had occurred. State investigators concluded that they had insufficient information to make a determination [PARC Case #89-117].

13. March 14, 1988. Chiloquin. Over twenty students and 5-6 staff at Chiloquin High School complained of medical concerns after returning to school Monday morning following a weekend application of Dursban (chlorpyrifos) to the exterior and crawl spaces of their school for termite control. Even after a "thorough airing" of the school, samples collected by the state showed chlorpyrifos present in air in a science room, and at "significant" levels in soil. The cases were classified as "documented" pesticide exposure. State investigators concluded that the product was applied according to the label, although it was found to have "bubbled up" from sites where rodding had been done into frozen ground [PARC Case #88-432].

14. June 13, 1987. Klamath County. A Little League ballfield was sprayed with Naptha and pentachlorophenol for weed control while children were present. Pentachlorophenol was found in clinical samples taken from one individual, though investigators said the levels were considered "normal" background levels and could not be used to confirm exposure. Enforcement actions were taken by ODA [PARC Case #87-378].

15. March 4, 1987. Portland. Staff members at Wilson High School complained of illness following an application of the insecticide safrotin (propetamphos) by a commercial pest control firm. It was over a week after the application before state officials were contacted. Safrotin residues were found in air and swab samples collected following the complaint. State investigators concluded that a misapplication had occurred, and took enforcement action against the applicator [PARC Case # 87-338].

Washington

PIRT = Pesticide Incident Reporting and Tracking Review Panel
WSDA = Washington State Department of Agriculture
DLI = Department of Labor and Industries
DOH = Department of Health

1. September 8, 1997. Marysville. A school employee was warned by WSDA for applying a mixture of Roundup Ultra (glyphosate) and Surflan (oryzalin) to the running track at Liberty Elementary School, though the mixture was not labeled for that use. The pertinent product label stated that it was for application to non-crop land, but did not specify that it could be applied to recreational areas such as school grounds or tracks [WSDA Case # 16V-97].

School vows to cut pesticide use

2. Spring, 1996. Mukilteo. A parent arriving at Columbia Elementary School in the early afternoon noticed a strong odor as soon as she got out of her car. Upon approaching the school, she witnessed two men in gas masks and protective suits spraying shrub beds and pavement areas in a courtyard near where about twenty children were running relays. Children commented about the "stinky" odor. The parent later found out that district groundskeepers were applying the herbicides Goal (oxyfluorfen) and Finale (glufosinate). Crossbow (2,4-D and triclopyr) had also been applied to the same area just days before in an effort to control horsetail, broadleaf weeds and grasses. The incident was not reported to any state agency at the time, and no investigation was undertaken, though it received significant TV and newspaper media coverage a year later [Morse, Margo. Pers. comm. 11/99; Mutschler, Kevin. Pers. comm. 11/99; 1997. School vows to cut pesticide use. *The Daily Herald* (Everett), 8/26; 1999. Breathing Easy: Columbia Elementary takes chemical-free approach to groundskeeping. *Tribune* (Mukilteo), 5/20].

3. April 12, 1995. Snohomish County. A teacher was splashed in the eye with Safer Insecticidal Soap (potassium salts of fatty acids) after a student dropped a bottle of semi-concentrate on the floor in a high school vocational grounds maintenance class. The case was classified as "definite" exposure. Symptoms were burning eyes which continued to water [PIRT Case # 95-0077].

4. April 3, 1995. Pierce County. An administrator reported nausea, headache and later hoarseness after entering a school office that had been treated with a resmethrin-containing insect bomb 3 days earlier. The headaches reportedly continued for over 40 days. State officials classified the case as "probable" exposure and illness [PIRT Case # 95 0049].

5. February 28, 1995. Cowlitz County. Seven employees reported various symptoms after entering a community college office on Monday morning following a treatment with the insecticide diazinon on the previous Friday night [PIRT Case # 95-0030].

6. January 7, 1994. King County. A teacher reported throat irritation, and students and teacher noticed odor entering classroom via air intakes as grounds crews applied Casoron (diclobenil) and Rout (oxyfluorfen) to control weeds in school shrub beds. Maintenance staff were cited for failing to keep adequate records and for applying the chemicals above the maximum label-specified rate [PIRT Case # 94-0009].

7. August 24, 1993. King County. A school custodian was exposed to an esfenvalerate-containing pesticide, and began choking and coughing. The state classified the case as a probable exposure and illness [DLI Case # 93-0315].

8. July 7, 1993. Spokane County. An adult suffered respiratory and dermal symptoms after entering a school building that had been treated with the insecticide malathion. Her symptoms reappeared each time she reentered the building. A week following the initial exposure and symptoms, she developed a persistant respiratory infection. The case was classified as probable exposure and illness by the investigating state agency [DLI/ PIRT Case # 93-0166].

9. January 3, 1991. Longview. Four employees of St. Helens Elementary School complained of ongoing health

problems, odors, and indoor air problems in the kindergarten annex. Bronchitis, pneumonia, upper respiratory problems, difficulty breathing, nausea, and headaches were among the symptoms that employees reported over a five year period. An investigator from the Department of Labor and Industries noted that exposure to residues of pyrethrum, pyrethroids (d-phenothrin) and piperonyl butoxide in the school carpets may have been responsible for triggering allergic reactions. The kindergarten rooms had been fogged or sprayed on a regular basis in an attempt to control continuing head lice problems. The DLI investigator said "residues from these products would be expected to fall to the floor and be present in the carpet, and activities such as vacuuming would reintroduce fine particles into the air." However, no violations of worker protection regulations were found [DLI Case # 111508156].

"Mommy, I'm Dying": Learning from A School Pesticide Tragedy

By Becky Riley

When first grader Michael Storey got home on the afternoon of February 27, 1989, he sat down on his toy chest and began telling his mom about his day at school. He started to read her a notice sent home by the school, but found he had to squint to make out the words. He moved the paper back and forth trying to decipher the blurry letters. "What's the matter with me, Mom? Am I going blind?" Kathi Storey remembers him asking. A few minutes later, Michael said he wasn't feeling well, and Kathi suggested that he lie down on the couch and watch TV. Within five minutes, he was vomiting uncontrollably, drooling heavily and unable to walk. He screamed, "Mommy, I'm dying," and passed out in his mother's arms.

Pediatrician Robert Fukara suspected poisoning and administered atropine as soon as he saw Michael's pin point pupils and other classic organophosphate poisoning symptoms. Michael was rushed to the local hospital's intensive care unit where, according to Kathi Storey, he spent the next two days "fighting for his life."

Luckily for Michael, Dr. Fukara's hunch had been correct, and the treatment administered was the correct one. After more than a week in the hospital, Michael was well enough to go home. Nearly two years after the incident, Michael no longer has nightmares about dying, and shows no external signs of impairment. However, a toxicologist consulted by the family indicated in a recent report that Michael could experience a recurrence of symptoms after even a slight re-exposure to an organophosphate pesticide. He recommended that the family move from the agricultural Yakima valley to reduce this risk.

How did Michael become exposed to this poison that nearly killed him and that has left him sensitized to minute pesticide exposures? As he describes it, he and some of his first grade schoolmates were playing under a tree on their schoolgrounds and found something that looked like "sand." They picked it up and played with it. Michael tasted it, and says that at least two other kids did, too. In fact, the "sand" was the extremely toxic organophosphate insecticide disulfoton (Di-Syston). It had been applied nine days earlier to maple trees at seventeen different sites around the school district to control aphids.

Roosevelt Elementary school in Yakima, Washington, like other schools across the country, routinely applies (or hires others to apply) disand other pesticides to control insect, plant, or fungus pests.

A Worst Case Scenario...

In one sense, the Michael Storey incident was a worst case scenario come true. Disulfoton is one of the most acutely toxic pesticides registered by the U.S. Environmental Protection Agency (EPA).[1] According to the agency, disulfoton is very highly toxic to mammals and is assigned to Toxicity Category I. Pesticides in this classification are required to follow EPA's most stringent labeling precautions and use restrictions.

An EPA-funded national hospital survey estimated that there were 170 hospitalizations related to disulfoton exposure and illness between 1977 and 1986.[2] Further, as is the case with many pesticides, EPA's most recently published disulfoton fact sheet states that a full hazard assessment of this chemical cannot be completed because of incomplete toxicological studies.[3]

A Washington Department of Agriculture (WDA) investigation of the incident determined that the company hired to apply the insecticide violated the Washington Pesticide Application Act.[4] The Willoughby Spray Company's records showed that 32 to 48 ounces of disulfoton granules were applied to each tree, but the product label calls for 2.5 to 27 ounces per tree, depending on the tree's size. Further, the chemical was applied when five inches of snow lay over frozen ground. The applicators, although they believed they were burying the chemical granules, were barely scraping the frozen surface and leaving mounds of (white) pesticide under a melting snow cover. The snow predictably *did* melt, leaving the mounds of pesticide granules completely exposed.

The WDA found the company in violation of state laws and regulations requiring that pesticides be applied in a manner consistent with the product label, as well as in a manner that is not careless or negligent and that does not cause damage to humans. The company was fined the maximum penalty of $1,000 for each of the three violations and its pesticide applicator's license was suspended for 14 days.[5] No enforcement action was taken against the school since it had contracted in good faith with a licensed applicator to do the treatments.

...Or a Predictable Nightmare?

In another sense, the Michael Storey incident was just one more in a predictable series of pesticide mishaps, misapplications, misuse, and overuse in schools. Other reported school pesticide incidents show that children and school staff have been made sick from exposure to a variety pesticides, and from misapplications as well as from applications made in accordance with directions on the pesticide label.

Some of these incidents have included: students and staff at Waianae Elementary School in Hawaii who developed headaches, stomachaches, breathing difficulties, nausea, and other symptoms after their school was treated with chlorpyrifos (Dursban 4E);[6] students and teachers at Henry Davis Elementary School in Tucson, Arizona who became nauseous in class and were evacuated to hospitals after malathion being sprayed by a neighbor was sucked into building ventilation ducts;[7] students and staff who suffered

Becky Riley is NCAP's fundraiser.

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10. March 14, 1990. Pasco. Eight people reported to a hospital for treatment after experiencing symptoms over a week-long period while in the reading room of Captain Gray Elementary. The room had been treated with Squad (pyrethrum/pyrethrins) and Dead End (resmethrin) for ants and roaches a week earlier. One product was applied around furniture and cracks and crevices, and the second was applied as an aerosol fog. Burning eyes, irritated nasal passages, headaches, nausea, dizziness, diarrhea, shortness of breath, sore throats, and hives were among the symptoms reported by staff beginning the day after the application, and recurring when they re-entered the room. The district was cited for failing to train all employees in hazard communication [DOH Case # 90-2008; DLI Case # 111501631].

11. February 27, 1989. Yakima. Seven-year old Michael Storey ingested granules of the highly toxic insecticide disulfoton that had been applied on the schoolground at Roosevelt Elementary School. He spent three days in intensive care "fighting for his life" and another week in the hospital following the incident. The school had applied the chemical in an effort to control aphids in some trees. The company hired to do the application was fined for using the chemical in amounts that were above the application rates specified on the label, and applying it in a careless and negligent manner [WSDA Case # 10-89].

Other States

1. January, 1999. Mandeville, Louisiana. Two students at Mandeville Jr. High School were exposed to Green Thumb Wasp and Hornet Killer (tetramethrin, phenothrin) sprayed by a teacher in a practice room for the school band in an effort to kill ants. One parent filed a health complaint expressing concern about possible health effects, though no symptoms were reported at the time. The spraying was reportedly done in violation of the district's pest management program. The state issued a warning letter to the district citing several violations of state pesticide law, including applying a pesticide in a manner inconsistent with its labeling, allowing a person to apply pesticides who was not a certified applicator, not keeping a record of the application, and applying a pesticide in a school while children were present or expected to be present within 8 hours [1999. Youths Exposed to Pest Spray at School, Report Will Check Chemical Levels. *The Times-Picayune* (New Orleans), 1/23; Louisiana Dept. of Agriculture and Forestry Case # B-14-01-25-99-NF-032-52-CI].


Chardon High evacuates classes to escape fumes

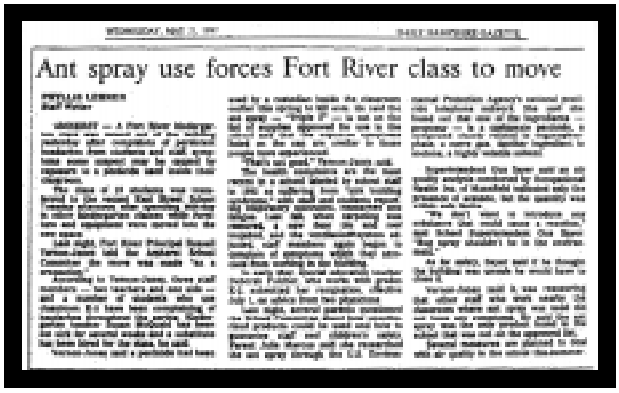
2. November 25, 1998. Washington County, New York. A parent filed a complaint with the state after seeing a school custodian at Greenwich Central School with Claire Lice Killer (pyrethrins, piperonyl butoxide), and being told that the chemical was applied in classrooms in an effort to control head lice. The parent's complaint also noted that she had seen school staff applying diazinon to control bees near the school building, and that her son had seen a janitor spraying playground equipment. The parent was concerned about potential exposure to her son and other students. An investigation showed that the school nurse had requested the spraying for head lice. Following an investigation, the district was cited for multiple violations of state pesticide law, including use of a pesticide product not registered in the state, authorizing applications by uncertified employees, failure to keep records of applications, and failure to post athletic fields that had been treated with Roundup (glyphosate). The school signed a consent order suspending a $2,500 penalty [Wainwright, John (New York Dept. of Environ. Conservation). Pers. comm. 1/14/00; Bennett, John (NYDEC). Pers. comm. 1/26/00; Case # R5-2312-99-02].

3. November 12, 1998. Mt. Pleasant, South Carolina. A pest control firm mistakenly drilled through wall voids and into two classroom walls at Laing Middle School during a "trench and rod" termiticide application to the building's exterior foundation. The pesticide Dursban TC (chlorpyrifos), which is not registered for interior use, was injected into the holes and into at least one of the classrooms. The teacher reported a strong odor upon returning to the classroom the next morning. She reported it to the principal, and the room was aired out. When the odor remained the following week, the students were moved to another classroom, and the pest control applicator was called back to the school. He noted the "strong smell" at that time, patched the holes in the walls, and hired a company to clean the carpets, walls, ceilings, desks and pencils in both classrooms. Some textbooks were replaced that had been contaminated with the pesticide. However, the odor persisted, and a second carpet cleaning and general cleanup was done in December.

A student mentioned the pesticide "spill" to a parent in late January, two and a half months after it occurred. This parent talked with school staff and realized that the incident had not been reported to state agencies. She reported the incident, and only then were other parents notified. Parents began to wonder if strange illnesses their children had been experiencing, including flu-like symptoms and one child with peeling hands, may have been caused by exposure to the chemical. Chlorpyrifos residues were found in carpet samples collected by state investigators two and a half months after the application, and following two professional carpet cleanings. The pest control company was cited and fined by the state for applying a pesticide in a manner inconsistent with its labeling. The school board later sued the pest control company [1999. Health agents to discuss school pesticide spill. *The Post and Courier* (Charleston), 3/17;1999. Board sues pest company. *The Post and Courier*, 3/23; South Carolina Dept. of Pesticide Regulation, Case # 0129991001].

4. July, 1998. Somerset, Wisconsin. Staff at the state Department of Agriculture, Trade and Consumer Protection circulated a survey to school districts in the state inquiring about their pesticide use practices. Agency officials noted that St. Anne's school filled out the survey

indicating that the school used chlordane, a persistent organochlorine pesticide that has been banned since 1988. An agency inspector visited the school and confiscated a partially used one pound container of the pesticide. He was told that the product had been at the school since at least the start of the school year, and that it had been used once during the most recent school year. The state agency did some testing of sites where the chemical had been used, but no residues were found. No injury, illness or exposure to the pesticide has been alleged. However, the chemical is classified by the US EPA as a probable human carcinogen. A warning notice was issued [Wisconsin Dept. of Agriculture, Trade, and Consumer Protection (DATCP) Case # 98-426-0707-02; US EPA "List of Chemicals Evaluated for Carcinogenic Potential," 12/31/94; Frederickson, Dave (DATCP). Pers. comm. 1/20/00].


Ant spray use forces Fort River class to move

5. June 9, 1997. Chardon, Ohio. Seven staff members and nine students at Chardon High School experienced dizziness and difficulty breathing and were treated at local hospitals after fumes of the herbicide HNS-300 (bromacil) seeped into the building. The herbicide was applied by school maintenance workers in a spot application to the perimeter of the building and under stadium bleachers. The fumes were drawn in by the ventilation system, and came in gymnasium windows. Complaints about odor were reported approximately one hour after completion of the application. The school was evacuated. The incident was not reported to the Ohio Department of Agriculture, though the agency did a site inspection three weeks later, after learning about the incident through newspaper accounts. It was found that the school district did not have any licensed applicators on its staff. The state inspector issued a "field notice of warning," though no citations or fines were levied [1997. Chardon High evacuates classes to escape fumes. *Plain Dealer* (Cleveland), 6/10; 1997. Fumes empty Chardon school. *News Herald* (Cleveland), 6/10); 1997. Ohio Dept. of Agriculture NLA and Pesticide Inspection Report, 7/3].

6. May 20, 1997. Amherst, Massachusetts. A kindergarten class was moved out of Fort River Elementary School after complaints of persistent headaches from three staff members and a number of students throughout the spring. One teacher was out ill for weeks. The school had a history of indoor air quality problems. However, some people in the school suspected that applications of an ant spray, Double Action Residual (propoxur, pyrethrins, piperonyl butoxide) might be contributing to the problem. The spray had been applied by custodians multiple times inside the kindergarten classrooms in March.

The teacher's union filed a complaint with the Massachusetts Pesticide Bureau on June 9. An inspection by the state occurred on June 19, three months after the pesticide applications were made and health symptoms began. Because of the untimely nature of the complaint, state investigators undertook no human or environmental testing. The state investigator concluded that the the pesticide applications were made according to product labels, and that any symptoms that had occurred were unlikely to have been caused by the pesticides. This conclusion was reached based on the fact that the last application was made over two months prior to the filing of the complaint, and that the active ingredient of the product was pyrethrins at a very low concentration. [In fact, the product also contained another active ingredient, propoxur, at ten times the concentration of the pyrethrins. The EPA classifies propoxur as "moderately persistent." Incident information reported to EPA between 1992 and 1996 showed that symptoms people experienced from post-application exposures to propoxur included headaches, nausea and respiratory irritation.] The school principal was quoted in a newspaper account the day after the school's evacuation as saying that exposure symptoms listed on the spray can are similar to ones that people reported experiencing. State investigators did note in their report that the school employees who made the applications were not licensed, and the applications had not been posted as required by state law [1997. Ant spray use forces Fort River class to move. *Daily Hampshire Gazette* (Amherst), 5/21; 1997. Mass. Dept. of Agriculture Case Summary re: Amherst School (Fort River), 8/21; 1997. EPA *Reregistration Eligibility Decision: Propoxur* (August); Kenney, John (Mass. Dept. of Agriculture). Pers. comm. 1/18/00].

7. 1997. Rosebud Indian Reservation, South Dakota. Approximately 100 children in two tribal Head Start programs were exposed to the pesticides Tisan and DDS-64 (both containing alkyl dimethyl benzyl ammonium

chloride) after the chemicals were used to dip and "sanitize" their toothbrushes. Many of the children developed medical problems, including blisters and burns in their mouths. The pesticides were labeled and registered for use as floor sanitizers. The Texas company that sold the pesticides to the tribe was convicted on three criminal counts of violating federal pesticide law. The company was also fined and ordered to pay restitution to the Federal Crime Victims Assistance Fund [1999. EPA Press Advisory: Texas Firm Sentenced for FIFRA Violations, 11/4].


METRO

State probes improper pesticide use at school

8. November 11, 1996. Racine, Wisconsin. Upon arrival at Wadewitz school on Monday morning, a matron and two teachers fell ill with dizziness, difficulty breathing and other symptoms, and were taken to a hospital emergency room. One of the hospitalized teachers had a history of asthma. Sixteen other employees reported illness symptoms, and one with a history of chemical sensitivity went home for the day, reporting headache, dizziness, itching, and nausea. A commercial pest control firm had applied Ficam W (bendiocarb) and Avert (avermectin) inside the school the previous Friday afternoon, as part of regularly scheduled pesticide applications in an effort to control ants and roaches. Air samples collected Monday afternoon did not contain measurable amounts of the pesticides tested for. Employees were not given blood or urine tests that could have determined pesticide exposure. No violations of pesticide law were found and no enforcement actions were taken by the state [Wisconsin Dept. of Agriculture, Trade, and Consumer Protection (DATCP), Case #96-414-111104; Fredericksoon, Dave (DATCP). Pers. comm. 1/20/00].

9. 1996. Annapolis, Maryland. An 11-year-old boy with a history of sensitivity to pesticides went into allergic anaphylactic shock after an unannounced application of an insecticide product containing Safrotin (propetamphos) at his private day school in Annapolis, Maryland. The pesticide was applied by a commercial applicator to hallways and the school kitchen while students were in classrooms [Berlin, Ruth. Pers. comm. 10/99].

10. 1995. Dripping Springs, Texas. A first grade student became ill after entering his Dripping Springs Elementary school classroom the morning after it had been sprayed with a chlorpyrifos-containing pesticide by a school employee in an effort to control fire ants. The student was reportedly chemically-sensitive, and considered "frail," having been born with lung and kidney problems. The Texas Structural Control Board found that the application had been made legally and according to the product label. The case was not reported to the Texas Department of Health [1995. Pesticide Incident in Schools, FY 1995, Texas Structural Pest Control Board; 1999. Texas Dept. of Health. *Human pesticide exposures occurring in Texas schools 1987-1999* (December)].

11. 1995. Del Valle, Texas. An elementary school was evacuated and the fire department called in after a petroleum-based herbicide was drawn into one end of the building via air conditioning units. The chemical was being applied by a school employee to an exterior area near the air intake units while students were present in classrooms. Information about whether any health effects were alleged, or any violations were identified, is no longer available, as the Texas Structural Pest Control Board routinely destroys case files after three years. The case was not reported to the Texas Department of Health [1995. Pesticide Incident in Schools, FY 1995. Texas Structural Pest Control Board; 1999. Human Pesticide Exposures Occurring in Texas Schools 1987-1999. Texas Dept. of Health (December)].

12. August 31, 1995. Minnetonka, Minnesota. The herbicide Trimec 959 (MCPA, MCPP, dimethylamine, dicamba) and a fertilizer were applied by ChemLawn to the soccer field at a middle school. A soccer game was played on the field 3-4 hours later. The soccer balls and children's shoes got "sticky" from contact with the field. Many people, including players, adults, and younger siblings rolled on the turf. The odor was reportedly strong, and because it was a hot, humid and windy day, the pesticide could be smelled in the nearby school building. A Chemlawn employee told state investigators that the field was not posted because Chemlawn had previously been told by school district maintenance staff not to do so. The label on Trimec 959 states: "Danger. Keep out of reach of children. Corrosive, causes irreversible eye damage. Do not get in eyes, on skin, or on clothing. Harmful or fatal if swallowed or absorbed through skin. Do not reenter treated areas until sprays have dried or dusts have settled." State Department of Agriculture

investigators concluded that though the field was "sticky," this was due to the fertilizer that had been applied at the same time as the pesticide, and that there was no evidence of violation of state pesticide law. The state Health Dept. does not have a case file on the incident [Minn. Dept. of Agriculture Case # 95-0767; Stroebel, Chuck (Minn. Dept. of Health). Pers. comm. 1/21/00].

13. August 23, 1994. Dallas, Texas. The principal and a district facilities supervisor noticed an odor as they walked through William Anderson Elementary School, and thought it might be a gas leak. They called the fire department, and the building was evacuated while they searched for the source of the odor. Finally it was determined that a teacher had sprayed malathion on house plants in her classroom before school started in an effort to control aphids. The odors were carried to various locations around the school, though the room was reportedly not on the central air system.

METRO/STATE B

Pesticide case poisoned parents' trust

System still fighting suit, working to finish cleanup

An employee who carried a plant out of the class room later complained of headaches and nausea and was taken to a hospital. One teacher complained of sore throat. A licensed contractor was hired to carry out a major cleanup of the classroom where the application occurred--all desks, books, plants, wall hangings, posters, and anything that could retain the smell of malathion were removed for disposal. Surface wipe samples taken after the cleanup still found traces of malathion, though these were deemed to present no significant health hazard. Nonetheless, another cleaning and re-painting of classroom surfaces was undertaken. Students returned to classes the next day. The school district was cited for failing to comply with regulations requiring that pesticides be applied in school facilities only by certified applicators. The case was not reported to the Texas Department of Health [Texas Structural Pest Control Board, Complaint Investigation #14-960-894F; 1999. Texas Dept. of Health. Human pesticide exposures occurring in Texas schools 1987-1999 (December)].

14. August 1994. Pierre Part, Louisiana. In the week before school opened for the fall, a school custodian sprayed the school yard around Pierre Part Primary School with the unregistered insecticide lindane in an effort to control rodents and fleas. Diazinon was also sprayed in and around 14 portable classrooms just before and during the first week of school. Teachers reported strong odors in the classrooms, and forty-one individuals, including students and teachers, reported adverse health effects in the first three days of school. Then another lindane application was made in several classrooms after school one day, and again just before students arrived the following morning. The school was closed later that day due to continuing health complaints and the lingering odor of the chemicals. A total of 98 health complaints were received and reviewed by the Louisiana Office of Public Health (LOPH). Illness symptoms reported by children and adults included headache, abdominal pain, diarrhea, nausea, skin rashes, difficulty breathing, and sore throats.

The school remained closed for weeks while three state agencies investigated the illegal application. The presence of pesticides was confirmed by analysis of wipe samples from classrooms and the playground. The National Guard was called in to help with decontamination (cleaning of classrooms and removal and replacement of playground soil and sod). Portable classrooms that had been directly treated with lindane were torn down.

The LOPH concluded that children were exposed to pesticides by inhaling vapors when they entered treated classrooms, and possibly via hand-to-mouth contact and skin absorption from touching residues on desks and teaching materials. The agency also concluded that the health symptoms reported were precipitated by pesticide exposure. Ironically, the LOPH report about the incident also noted that "the flea infestation remained a problem in the school, even though copious amounts of pesticides had been used."

The parish school board was fined $2,500 for violating state pesticide laws. A class action lawsuit filed by parents against the school district was settled in 1998. The district spent nearly a million dollars for soil testing, cleanup, and re-building [1994. 2nd Pierre Part school closed after pesticide contamination. *The Advocate* (Baton Rouge), 8/30; 1994. Two Pierre Part schools continue pesticide cleanup. *The Advocate*, 9/1; 1996. Pesticide case poisoned parents' trust. *The*

Advocate, 5/12; Packer, Jay (attorney) Pers. comm. 5/97, 11/99; 1996. Public Health Aspects of Pesticide Exposure at Pierre Part Primary School. New Orleans: Louisiana Office of Public Health (June)].

15. September 27, 1993. Montgomery County, Pennsylvania. Seventeen children were sent home from Montgomery Elementary school just after lunch with headaches, nausea, vomiting, diarrhea, and low-grade fevers. Food-poisoning was ruled out, as the children ate different things. One alert parent noted that her son's "flu-like" symptoms (headaches, stomach aches and low-grade fever) returned when he returned to school the following week. She also noted that his symptoms seemed to occur when he was in the cafeteria or after lunch, but cleared up over the weekend. The she learned that at least one teacher and eleven other students were also experiencing frequent headaches, stomach aches, and low grade fevers at the school, and one girl suffering from the symptoms had a grand mal seizure.


Pesticide

The parent began to investigate further after her son's doctor suggested she call state agencies about having the school tested for environmental contaminants. She learned that the school was making regular applications of Dursban (chlorpyrifos) in the kitchen, cafeteria, and teacher's lounge in an effort to control ants, and that an application of the insecticide was made at the school on September 27, the day that so many children got sick. The parent reports that she was given different stories about the time of day that the application occurred, but she believes that it was made during the school day.

The parent asked her son's doctor to do a blood chlolinesterase test, and the results indicated a recent exposure to organophosphate pesticides. The County Health Department took air samples at the school 19 days after the pesticide application. Samples were collected in the cafeteria and in a classroom, where windows were opened for ventilation during the test. The tests failed to find pesticide residues. [In fact, the tests that were done were not designed to detect organophosphate pesticides. Experts consulted about the testing say that it was conducted improperly, and furthermore, that any pesticides residues that remained at that point would likely have been absorbed into the carpet.] No other environmental tests were done, or human blood or urine samples collected. The agency concluded that there was no evidence of a public health hazard. No attempt was made to determine the cause of ongoing illness symptoms reported by students or the teacher. One boy remains chemically sensitive, according to a letter from his doctor.

The state Department of Agriculture has lost or inadvertently destroyed its files on this case. However, personal notes by one investigator say the agency concluded that the illnesses at the school on September 27th occurred before the pesticide application was made that day, and that no pesticide violations were found. The state Health Department did not get involved in the investigation [1994. Law targets school pesticide use. *The Morning Call* (Allentown), 1/26; 1995. Letter from Dr. Jeffrey Fogel, MD, 8/7; 1993. Indoor Air Quality Report for Montgomery Elementary School. Montgomery County Health Department, 11/15; Eash, Connie. Pers. comm. 12/15/99 and 1/16/00; Uram, Joe (Penn. Dept. of Agriculture). Pers. comm. 12/8/99; Riecke, Bob (US EPA). Pers. comm. 1/20/00; Scott, Marilyn (Oregon Health Division). Pers. comm. 1/18/00].

16. 1993. Forestville, New York. Forestville Central High School was evacuated and closed for a day in late May following application of a "weed and feed" product, Vegetation Control with 2,4-D (2,4-D), to lawns around the school. Odors were drawn into the school via the ventilation system. The district was cited for allowing pesticides to be applied by an uncertified applicator, and was fined $500. Then, just a few months later, a custodian under the direction of the school nurse sprayed Rid Lice Control Spray (permethrin) in an elementary classroom on the same central school campus. The school district was again cited for allowing pesticides to be applied by an uncertified applicator, and signed a consent order waiving a $1,200 penalty [New York Dept. of Environ. Conservation (NYDEC) Consent order # R9-4025-93-09; NYDEC Consent order # R9-4099-94-01; Wainwright, John (NYDEC). Pers. comm. 1/14/00; Reinhardt, Glen (NYDEC). Pers. comm. 2/7/00].

17. Fall 1993-Spring 1994. Indiana. Eighth-grader Emily Schultz was diagnosed with non-Hodgkins lymphoma in the fall of 1993. In struggling to find out what could have caused their young daughter to contract this deadly disease, her parents learned that studies have found that people exposed to 2,4-D and other phenoxy herbicides have been shown to have elevated rates of this cancer. Then they discovered, much to their horror, that their daughter's school district was routinely using this very herbicide to kill dandelions and keep its school grounds looking neatly groomed.

Emily's cancer was brought into remission by a grueling course of chemotherapy. However, on the girl's first day back at school in the spring, the school district made another application of herbicides to the school ground. When Emily's mother arrived to pick up her daughter that afternoon, she was horrified to smell the chemical odor, and appalled to realize that she had brought Emily into contact with the chemical while she was in a weakened and vulnerable condition. Sadly, the girl's lymphoma did return within the month. She died before summer's end that year. Having failed to identify any other known risk factors relevant to their daughter, Emily's family believes that exposure to 2,4-D-containing weed-killers which were used at her school may well have caused or contributed to her initial illness, her relapse, and her eventual death [Schultz, Kathy. Pers. comm. 1994, 12/99].

18. December, 1992. Ashtabula County, Ohio. Maintenance staff at a school for multiply handicapped children decided to use an old bottle of the insecticide malathion, spreading it around the perimeter of a small shed in an effort to control rodents. They applied the chemical on a Wednesday night after school was out. The next morning the insecticide vaporized, and winds carried the fumes into a room where students and parents had gathered for a holiday play. Many people noticed the odor, and several staff members complained of nausea and sore throats. By noon, complaints and "strange maladies" increased, including excessive salivation, tearing, nausea, fatigue and headaches. Part of the school was evacuated, but vapors then entered other parts of the building via windows and heating intake ducts. At least two people went to visit private physicians because of health complaints associated with the exposure, and their physicians validated their conditions. The Ashtabula County Health Department later concluded that the symptoms experienced were most likely related to exposure to the petroleum distillate base.


A Toxic Nightmare

The school was closed the next day, while air testing and cleanup began. The shed and contaminated soil around it were removed on Monday, still carrying an 'overpowering stench' of the pesticide. Air samples taken in the school on Monday morning showed no traces of the insecticide, and school officials planned to re-open the school, but state health department officials suggested that the school wash every surface in the school three times to ensure that no traces of the chemical (or its petroleum base) would remain. Ultimately, the school was closed for over a week, and cleanup and waste removal cost more than $15,000 [Cozza. 1993. A Toxic Nightmare. *American School Board Journal* (Sept.); Saporito. 1993. An Expensive Lesson: The Misuse of a Pesticide in a School Setting. *Ohio Journal of Environ. Health* (May/June); Saporito, Ray (Ashtabula County Health Dept.). Pers. comm. 1/18/00].

19. December 7, 1992. St. Paul, Minnesota. Four students and three adults from Woodbury High School were treated at a nearby emergency room after they were exposed to the insecticide malathion. Another 27 students were examined by emergency room personnel. Students reported lightheadedness, and a teacher reported a headache. The incident occurred when a student mixing a spray for use on plants in the school's greenhouse spilled about half a cup of it. He used his bare hands to wipe up the spill. However, the solution evaporated and fumes quickly spread into an adjacent classroom and hallway. Students were immediately evacuated, and the fire department was called. The state health department does not have file on this case [1992. Woodbury students exposed to pesticide. *Saint Paul Pioneer Press*, 12/8; Stroebel, Chuck (Minnesota Dept. of Health). Pers. comm. 1/20/00].

20. October 26, 1992. New York City. Children, teachers and other staff of Eastchester High School noticed a strong odor and experienced headaches, nausea, and eye and respiratory irritation immediately following their return to school on Monday morning. Some children developed rashes, sore throats and other symptoms. The school had been sprayed over the weekend for roach control with the pesticides Empire 20 (chlorpyrifos), Vectrin (resmethrin), and

diazinon. A boric acid paste was also applied. The applications were part of the routine pest control program used throughout the district.

The school was closed later in the day. It was ventilated, and then reopened for part of the next day, but then closed again due to continuing strong odors. A professional cleaning firm was hired to conduct a massive cleanup, including new paint and floor caulking in some areas. However, air and surface wipe samples taken after the cleaning showed the chlorpyrifos was still present in many locations, so another cleaning was done. Even after the second cleaning, small amounts of pesticide remained, but a decision was made to re-open the school. Ultimately, the school was closed for almost three weeks as crews worked to clean up the pesticide residues. The pest control firm that made the application was cited for numerous violations, and their business license was revoked. A state and county health department report on the incident concluded that the symptoms seen among students, teachers and staff were consistent with exposure to the pesticides. A newspaper account quoted a county health official as saying that inhalation and dermal exposure to the "inert" petroleum distillates in one of the products were likely to be the cause of most of the symptoms. Several lawsuits resulted from this incident. Parents noted that the roaches returned to the school even before the students did [1993. School Weighs Risk of Pesticide. *The New York Times* (New York City-Westchester Section), 1/10; 1992. Fact Sheet: Eastchester High School Pesticide Application. New York State Dept. of Health/Westchester County Health Dept. (November); Wainwright, John and Krebs, Carol (NYDEC). Pers. comm. 1/00; Riley. 1993. When will school districts learn that pesticide problems don't just go away? *Journal of Pesticide Reform* 13(4):26].


The Miami Herald

Insecticide fumes send 42 to hospital

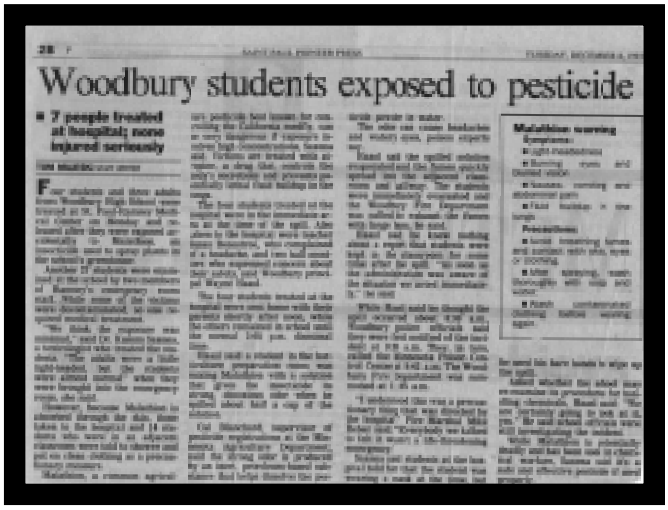
21. <u>January 21, 1992. Saddle Brook, New Jersey.</u> Scores of children complained of sore throats, headaches, difficulty breathing, nausea, vomiting and rashes and were sent home in the days after End-sect Insecticide (resmethrin) was applied by school maintenance workers in a crawl space underneath a first grade classroom during school hours. Another chemical, End-Sect Vaporizer (pyrethrins, piperonyl butoxide) had been applied by a night custodian just a week earlier around the sink in the classroom. Both applications had been made in an effort to control termites. The chemicals, which were no longer legally registered for use, were applied by school employees who were not licensed pesticide applicators. The chemicals were both being stored in 30 gallon drums, one in a crawlspace under the school, and one in a garage at another school. Of note, the area under the first grade classroom had been treated for termites with 55 gallons of another insecticide by a commercial pest control firm just nine months earlier. Another part of the school was also treated with Orthene by a second pest control firm just the day after the January 21st application by school employees. Another application of 120 gallons of a termiticide was also made under the kindergarten room on February 1st.

A complaint was filed with the state on Friday, January 24th by a parent, and a state inspector arrived at the school to do an inspection and testing on Monday, January 27th. After samples were collected, school officials elected to close the school pending results. A swab sample collected near the classroom sink showed residues of pyrethrins (applied there 11 days earlier). Air samples from the classroom and crawlspace were analyzed only for petroleum distillates, not for the active ingredients of the pesticide products used. The inspector noted that there were no established air standards for the active ingredients of the products used, pyrethrin or resmethrin. The sample from the crawlspace was positive for petroleum hydrocarbons, while the sample from the classroom did not show detectable levels of petroleum hydrocarbons (six days after the crawlspace application).

The school was reopened on February 3, after a four day closure while the chemical was cleaned up. School board trustees were fined nearly $6,000 by the state Bureau of Pesticide Compliance for ordering pesticide applications to be made by unlicensed employees, and for illegal use of a cancelled pesticide product. One parent filed a notice of intent to sue, in an effort to cover medical expenses related to surgery her 6-year-old had to remove gum boils the parent says were related to the exposure. Other children apparently also developed gum boils the week of the incident. The state health department has no case file on the incident [1992. Pupils moved pending tests for pesticide. *The Record* (Saddle Brook, NJ), 1/29; 1992. Trustees fined in pesticide misuse; incident sickened students.

The Record, 4/23*;* 1992. Pesticide spraying is probed at school; Rash of illnesses prompts closing. *The Record,* 1/28; 1992. New Jersey Bureau of Pesticide Compliance Case file "Franklin Elementary School, Saddle Brook Board of Education," 3/9].

22. May 8, 1991. Coral Springs, Florida. Thirty-four students and eight adults were sent to area hospitals, and 10 others were treated by paramedics at Forest Hills Elementary School the day after being overcome by strong pesticide fumes. Symptoms reported included churning stomachs, dizziness, and a pepper-like bad taste in the mouth. The school had been sprayed the night before with two synthetic pyrethroid insecticides, Tempo 20 WP (cyfluthrin), Micro-Gen ULD BP-100 (pyrethrins, piperonyl butoxide). Investigators suspected that some of the insecticide had landed on top of steamers or ovens in the cafeteria, and later volatilized when the ovens were turned on, resulting in the sickening fumes. All 175 schools in the Broward County school district were sprayed regularly with these same chemicals in an ongoing effort to control roaches, ants, and fleas [1991. Insecticide fumes sicken 42 at school. *The Miami Herald*, 5/8].



Woodbury students exposed to pesticide

■ 7 people treated at hospital; none injured seriously

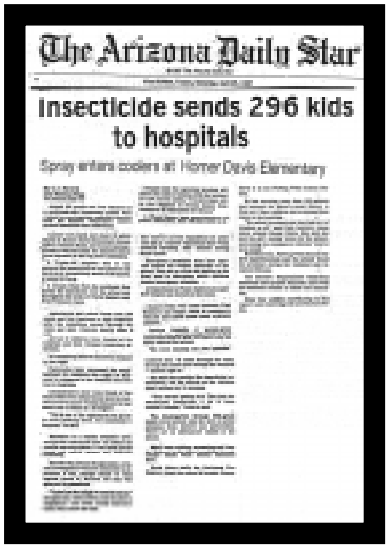
23. May 5, 1989. Cross Lanes, West Virginia. Andrew Jackson Junior High School was closed after four years of complaints by teachers and students of persistent coughs, fatigue, headaches, respiratory problems, nausea, and numbness in their limbs. Federal investigators found the cancer-causing pesticide chlordane in the air at levels 11 times higher than the federal evacuation limit. The chemical was applied at the school to combat termites. The school district paid $600,000 in 1995 to settle a lawsuit brought by 67 students and school employees who said they experienced nerve damage, immune system problems, bone marrow dysfunction, aching joints, allergic reactions and cancer resulting from the exposure. The exterminator paid over a million dollars. The school was reopened in February of 1990 after an extensive cleanup [1995. Kanawha School Board to Shell out $600,000 to Settle Suit over Pesticide. *The Charleston Gazette*, 6/24; 1989. Chlordane Contaminated School Shut. *Pesticides and You*. Washington DC: NCAMP (August)].

24. 1989-1990. Greenville County, South Carolina. After a parent inquiry, state investigators found a pattern of illegal pesticide applications in Greenville County schools, including fogging of classrooms with the restricted use pesticide lindane (in an effort to control head lice), indoor use of an agricultural formulations of diazinon, and applications by non-certified school maintenance personnel [1990. School district broke pesticide regulations. *Greenville News* (Greenville), 5/12; 1990. Pesticide Use Investigation Non-Ag Followup, Dept. of Fertilizer and Pesticide Control vs. John Ramey and Ideal Feed and Seed Company, Inc., 5/23].

25. April 28, 1987. Grand Island, New York. The local fire department was called in to evacuate Kaegebine Elementary School when strong pesticide odors entered classrooms after plants in a solarium inside the school foyer were sprayed with an "over-the-counter" malathion product. The spraying was done by two volunteers at the school who were members of a local garden club. They were attempting to control mealy bugs on the plants. The school was re-opened the following day, after a cleanup and air sampling by the Health Department. A warning letter was sent to the school for allowing the application to school property by unlicensed individuals. However, no enforcement action was taken [Wainwright, John (New York Dept. of Environ. Conservation (NYDEC)). Pers. comm.1/14/00; Reinhardt, Glen (NYDEC). Pers.comm. 1/27/00].

26. April 24, 1987. Tucson, Arizona. Nearly three hundred children were evacuated to hospitals with stomach aches, headaches, nausea, dizziness and breathing difficulties after malathion sprayed by a neighbor got sucked into classrooms via the ventilation system at Homer Davis Elementary School. Some researchers at the University of Arizona College of Agriculture later wrote an article attributing the episode to epidemic hysteria triggered by the malathion odor [1987. Insecticide sends 296 kids to hospitals. *Arizona Daily Star*, 4/25; Baker and Selvey. 1992. Malathion-induced epidemic hysteria in an elementary school. *Veterinary and Human Toxicology,* 34(2)].

27. January 28, 1987. Silver Creek, New York. A school custodian, under direction of a school nurse, sprayed Diatox C (diazinon) on carpeting in four classrooms at Silver Creek Elementary School in an attempt to control head lice. The "over-the-counter" product that was used was not registered for use in New York. Though the application was made on a Saturday, strong odors lingered when classes resumed on Monday. Despite cleaning efforts, the rugs eventually had to be removed. The classrooms were unusable for several days. The district was cited for applying a pesticide inconsistent with its label (it was not labeled for head lice control), and for allowing the application to be made by an unlicensed applicator, among other violations [New York Dept. of Environ. Conservation (NYDEC) Consent order # R9-2040-87-03; Wainwright, John (NYDEC). Pers. comm. 1/14/00; Reinhardt, Glen (NYDEC). Pers. comm. 2/7/00].


The Arizona Daily Star

Insecticide sends 296 kids to hospitals

Spray enters coolers at Homer Davis Elementary

28. October 2, 1986. Honolulu (Oahu), Hawaii. At least 30 children and three adults at Waianae Elementary School complained of headaches, stomach aches, breathing difficulties, dizziness, nausea and other symptoms. An application of the insecticide Dursban 4-E (chlorpyrifos) had been made (by the state health department) around the perimeter of certain school buildings the afternoon before in an effort to control fleas present because dogs were sleeping under the portable classrooms. Another application had been made just two weeks earlier. Health Department investigators found "no evidence of pesticide misuse." However, the agency's epidemiologist stated in a letter that the evidence indicates that health symptoms may have been caused by solvents (xylene) and other ingredients (diethyl sulfides) in the pesticide. The school remained closed the following day. An inspection done after the second treatment found that the fleas were still present. Following this incident, the school installed screens around crawl spaces to prevent access by the dogs [Anderson. 1986. Memorandum to Deputy Director for Environmental Programs re: Waianae Elementary School Investigation. Hawaii Dept. of Health, 10/20; 1986. Flea treatment fumes cause early dismissal at Waianae.*The Honolulu Advertiser*, 10/3. 1986. Pesticide scare at Waianae is over, but fleas live on. *The Honolulu Advertiser*, 10/3].

Unintended Casualties

Five Children Whose Lives Were Profoundly Affected by Pesticide Exposures at School

April 2000

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Preface

This packet contains five stories of children whose health and lives were affected in profound and permanent ways by pesticide exposures at school. In two of the cases, parents and doctors consulted by the family believe that pesticide exposure caused or contributed to the children's deaths.

This packet is intended to accompany the report, *Unthinkable Risk: How Children Are Exposed and Harmed When Pesticides are Used at School.* That report documents 98 school pesticide exposure incidents.

Michael Storey: *A Near Death Experience*

First-grader Michael Storey was not the intended "pest" the day that a pest control contractor came to his Yakima, Washington elementary school to apply an insecticide around the roots of the huge old maples on the school ground in an effort to control aphids. However, Michael did end up as an unintended casualty of the application when he unknowingly touched and tasted the "sand" (actually granules of a highly toxic nerve poison) that he found in a pile under one of the trees a few days later. Shortly after returning home from school, he began experiencing blurry vision, heavy drooling, chest and throat pains, and uncontrollable vomiting. He passed out in his mother's arms, and was rushed to a hospital emergency room. Fortunately an astute physician made the right diagnosis (organophosphate pesticide poisoning) and administered the correct antidote. Michael survived, though he spent two days in intensive care "fighting for his life" and another week in the hospital following the incident.

Because of the immediate and acute symptoms, there is no doubt that Michael's harrowing experience was caused by exposure to the pesticide applied on his school ground. Luckily, he survived, but his family and doctors say they will probably never know what may be the long-term or permanent effects of this near-death experience [WSDA Case # 10-89; Pers. comm., Kathi Storey, 1990].

Emily Schultz: *Cancer Claims a Young Life*

Surely no one intended to harm Indiana eighth-grader Emily Schultz on the pleasant spring day in 1994 that she returned to her junior high school classes. The day should have been a joyful occasion--the girl's first day back after grueling months of chemotherapy treatment for cancer--but it turned into an upsetting experience instead. When Emily's mother came to pick her up after school, she noticed a strong chemical odor. Much to her horror, she soon determined that an herbicide had just been applied to the school's lawn as part of the district's routine applications to kill dandelions and keep the grounds looking neatly groomed.

The weed-killer used by the school had been associated in human studies with increased risk of the type of cancer (non-Hodgkins lymphoma) that Emily had battled. Emily's mother already knew this from research she had done trying to understand what could have caused her daughter to contract this deadly disease. Emily's parents had shared their concerns about the herbicide with school administrators, and had asked them to suspend use of the chemical while Emily was attending school. They were stunned and horrified to find that the lawns had been treated again while she and other students were present. The Schultz's had thought the problem had been dealt with and that their daughter would be safe at school. Instead, they unknowingly brought her into contact with the chemical on her first day back and while she was in a weakened and vulnerable condition. Emily did not experience any noticeable illness that day, but, heartbreakingly, her lymphoma did return within the month. She died before summer's end that year.

Unlike Michael's family, Emily's parents know that neither they nor their family's doctors will ever know with certainty whether the girl's initial cancer, or her relapse, were caused by exposure to the herbicide used at the school. However, they do know that their daughter had no other known risk factors. They also know that exposing their daughter to this chemical that has been associated with non-Hodgkin's lymphoma, especially when her immune system was suppressed from chemotherapy, was a risk they would never have considered taking. They do not believe that the school should have considered taking that risk either [Pers. comm., Kathy and Jerry Schultz, 1994, 1999].

Matthew Matelko (and others): *Asthma, Stomach Aches and Bleeding Scalp*

When school administrators installed automatic insecticide dispensers in classrooms, restrooms, and the cafeteria at Jurupa Hills Elementary School their intent was to control the flies that were a chronic problem due to the school's location just across the street from a chicken ranch. When these same administrators hired a pest control firm to do additional spraying on a monthly basis for other "pests" such as crickets, silverfish, ants, earwigs, spiders and roaches, undoubtedly they believed they were helping create a better learning environment for the children in their care, and it surely never crossed their minds that the "solution" they were providing might cause more harm than the "pests." But that is just what did happen.

Parents began to notice strange symptoms in their young children after they began attending the school. Five-year-old Matthew Matelko suffered rashes and blisters on parts of his body that came into contact with classroom surfaces. Matthew also developed a smoker-like cough, diarrhea, stomach pains, and shortness of breath. One fifth-grader experienced fatigue and unbearable stomach pains, and was eventually hospitalized. She missed months of school due to her illnesses. Another kindergartner began to suffer bleeding blisters on his head and hair loss when he started attending the school. Other children also experienced asthma-like symptoms. The day after a dispenser was installed in one classroom, the teacher returned to find that silkworms that she had been rearing for a class project had all died.

Pyrethrins, the active ingredient of the pesticide used in the automatic dispensers, can be readily absorbed via inhalation. Symptoms of overexposure include contact dermatitis, allergic respiratory reactions such as rhinitis (inflammation of mucous membranes in the nose) and asthma, and some irritant or sensitizing reactions. According to information from the manufacturer, symptoms of exposure to the specific product used in the dispensers include headaches, nausea, vomiting, abdominal cramps, and dermatitis.

The families' doctors were initially baffled by the children's strange symptoms. Matthew's mother was the first to suspect that pesticide exposure at the school might be the cause of her child's ill health. She contacted the county Department of Agriculture to request pesticide application records from the neighboring chicken farm, and then learned that the school itself was applying pesticides. Her request for records triggered an investigation of the school's pesticide use practices by the Department of Agriculture. Investigators did find some violations of pesticide laws (some of the pesticide dispensers in the school's cafeteria were located too close to food handling surfaces). But no air or surface swab samples were taken in classrooms or anywhere else.

Following the initial contact by the Department of Agriculture, the school principal ordered that the automatic pesticide dispensers be turned off. However, school officials continued to assure parents that pesticides were not the cause of their children's health problems. "Experts" consulted by the school district, relying on strictly theoretical calculations, wrote letters stating that any exposures the children would have received from the pesticide mists that were automatically dispensed over their heads every fifteen minutes would be far lower than a dose that could conceivably cause harm. The parents of one child were told that his bleeding scalp was likely caused by the family's shampoo.

Skeptical parents were not convinced. Several families initiated lawsuits against the school and/or the pest control company that serviced the pesticide dispensers. One case is still pending [Matelko, Janine. Pers. comm. ; Friedman, Michael. Pers. comm. Hixson, Lorena. Pers. comm. 12/99-1/00; 1995. Pesticide Episode Investigation Report. San Bernardino County Department of Agriculture, 3/28; 1998. Lethal consequences. *Inland Valley Daily Bulletin* (Ontario), 2/10; 1999. EPA Recognition and Management of Pesticide Poisonings; 1990. MSDS, Purge III Insect Killer, Waterbury Companies, Inc. (8/1)].

Chrissy Garavito
Loss of Consciousness and a Sudden Death Due to Cardiac Arrhythmia

When a middle school in Fontana, California hired a pest control firm to apply insecticides in an effort to control flies and other insect pests at the school, surely school administrators did not believe that they could be putting children at risk of serious harm or death. When eighth-grader Chrissy Garavito started visiting the school nurse multiple times a week after experiencing headaches, nausea, and dizziness in class, the nurse was concerned enough to phone her mother, but no one suspected pesticides might be the cause of the girl's health problems. Even after Chrissy experienced multiple frightening episodes at the school where she inexplicably stopped breathing, lost consciousness, and had to be rushed to the emergency room, school officials and medical experts did not connect pesticide exposure with her condition. Doctors diagnosed her at different times as having epilepsy, hypoglycemia, and finally, "psychosomatic" illness.

Finally, just a month after completing her first year in high school, Chrissy suddenly stopped breathing and collapsed into a coma while playing baseball at a local park. She was rushed to a hospital, but this time she was not so lucky--doctors were unable to revive her and she never regained consciousness. She died six days later, after being taken off life support.

Electrocardiogram (EKG) tests taken during the week she was on life support showed that Chrissy was experiencing an unusual and very serious disturbance in her heart rhythm. It was also during this week that Chrissy's mother, Janine, first learned that an EKG taken after one of her daughter's earlier episodes at the middle school had also shown the same abnormal heart rhythm. These EKG results now led doctors to speculate that Chrissy might have had a previously undiagnosed genetic 'syndrome' known to put certain people at heightened risk for the heart rhythm disturbance.

Things might have been left at that, except that Chrissy's mother was not content with these vague answers. Wanting to find an explanation for why her athletic young daughter would suddenly collapse and die, she ordered extensive genetic testing on her daughter's body tissues. The results failed to identify any known genetic factors that might have predisposed the girl to the heart rhythm abnormality.

Continuing her search of the medical literature and consulting with experts, Janine learned that the heart rhythm disturbance that killed her daughter can also be triggered by exposure to some specific classes of chemicals, and that these chemicals include certain medications, as well as certain nerve-poisoning insecticides.

Doctors ruled out exposure to medications as a cause of Chrissy's problem. Janine then requested the pesticide application records from her daughter's middle school and from other local agencies, and learned that the herbicide Roundup, and several nerve-poisoning insecticides, including diazinon, chlorpyrifos, cyfluthrin, and cypermethrin were used regularly at the school during the time that the girl had experienced seizures and other illness symptoms. Insecticides were also regularly sprayed in the community by the County Vector Control agency, and various herbicides and other pesticides were used regularly in the park, including on the baseball field where the girl died.

Several major classes of insecticides, including organophosphates and synthetic pyrethroids, kill insects by disrupting their nervous systems. While these chemicals do not all act by exactly the same mechanism, they all disrupt electrical signals in a way that has the potential to cause heart rhythm abnormalities. Perhaps more surprisingly, exposure to some commonly-used herbicides, including those used in the park, can also cause rapid heartbeat, heart palpitations, disruption of electrical signals in the nervous system, or other adverse neurological (nerve-poisoning) effects in humans.

Though initially sceptical, a cardiologist (and director of electrophysiology) at Loma Linda Medical Center consulted by the family now believes that exposure to nerve-poisoning pesticides is the only likely explanation for what could have triggered the heart arrhythmia episodes that eventually killed Chrissy Garavito. The school district has signed a legal settlement with the family, and a lawsuit is still pending against the city and county [Matelko, Janine. Pers. comm. 12/99, 1/00; Platt, Dr. Mark (Loma Linda Medical Center). Pers. comm. 12/99, 1/00; 1996 and 1997. Pesticide use records from Southridge Middle School and Fontana's Village Park. San Bernardino Department of Agriculture; 1998. Pesticides. *Inland Valley Daily Bulletin* (Ontario), 2/9].

Michael Eash
Chronic "Flu" and Chemical Sensitivity

When school officials at Montgomery Elementary School hired a contractor to make regular pesticide applications in the cafeteria (and elsewhere) to control ants, undoubtedly they believed they were acting to protect the health of the children and staff at the school. However, the evidence suggests that the pesticides themselves were responsible for triggering chronic "flu-like" symptoms in many children, and chemical sensitivity in one boy.

According to his pediatrician, Michael Eash was a healthy child until he began attending first grade at the school in 1992. There, he missed 30 days of school due to "flu-like" symptoms. After starting second grade in the fall of 1993, the boy continued to experience low grade fevers, intermittent bouts of diarrhea, and daily headaches and nausea. His mother, Connie, noticed that his symptoms increased over the week, but cleared up over the week-end, and that his headaches and nausea seemed to occur when he was in the school cafeteria or after lunch. She began to pick him up and take him out for lunch each day.

By late October, Connie was in constant contact with the school, and with her family's doctor, trying to determine what was making her son so sick. Among other things, she learned that the school was making regular applications of the organophosphate pesticide Dursban (chlorpyrifos) in the kitchen, cafeteria, and teacher's lounge in an effort to control ants. Pesticide "spot treatments" were also occasionally made to other areas of the school, though the district and the pest control firm said that no treatments had been made to classrooms that year.

Still believing that her son might be experiencing recurring bouts of flu, Connie made an appointment for him to get a flu shot in the first week of November. Meantime, at a conference with her son's teacher in early November, she learned that the teacher and at least eleven other students in his class were also experiencing frequent headaches, stomach aches, and low grade fevers, and that one girl suffering from the symptoms had a grand mal seizure.

When she arrived at school to pick up her son for his doctor's appointment a week later, Connie noticed that the classroom has a strong odor. Not only that, but Michael was again at the nurse's office, complaining of headache and nausea, and with a low-grade fever. Two other mothers who went to the classroom that afternoon also noted the odor, and reported feeling ill after being in the room. After looking at Michael later that afternoon, his doctor suggested that Connie contact state and federal agencies and have the school tested for environmental contaminants.

The next day, she did contact numerous federal, state, and local agencies. She also contacted other parents, who returned with her to the school and again noticed the odor in the classroom. Also, after doing her own research on the subject of pesticides, Connie learned that a blood cholinesterase test is the diagnostic tool for organophosphate pesticide exposure. She requested that this test be done on her son, and it was done in mid-November. The results showed abnormally low levels of cholinesterase, indicating a recent exposure to organophosphate insecticides.

Michael's mother took him out of school and began home schooling him. His cholinesterase levels were checked again two weeks later, and at five weeks. The levels were significantly increased at two weeks after leaving school, and had returned to a normal level at 5 weeks. He remained symptom-free while he was out of school.

Both Michael's mother and his doctor believe that pesticide exposure at school caused his constant "flu-like" symptoms. His doctor also wrote a letter stating that he believes the boy is now chemically-sensitive, and will develop headaches, nausea, and other symptoms whenever he is re-exposed to even small amounts of pesticides or similar compounds [1994. Law targets school pesticide use. *The Morning Call* (Allentown, PA), 1/26; Letter from Dr. Jeffrey Fogel, MD, 8/7/95; 1993. Indoor Air Quality Report for Montgomery Elementary School. Montgomery County Health Dept., 11/15; Eash, Connie. Pers. comm. 12/15/99 and 1/16/00; Uram, Joe (Pennsylvania Dept. of Agriculture); Pers. comm. 12/8/99; Riecke, Bob (US EPA). Pers. comm. 1/20/00; Scott, Marilyn (Oregon Health Division). Pers. comm. 1/18/00].