SUMMARY OF HEALTH-RELATED PESTICIDE INCIDENTS

REPORTED IN LOUISIANA

FROM OCTOBER 1995 THROUGH SEPTEMBER 2000

Louisiana Department of Health and Hospitals
Office of Public Health
Section of Environmental Epidemiology and Toxicology
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Table of Contents

TABLE OF CONTENTS ..... **iii**

LIST OF FIGURES ..... **iv**

LIST OF TABLES ..... **iv**

LIST OF TABLES ..... **iv**

ABSTRACT ..... **v**

I. INTRODUCTION **1**

II. INVESTIGATIVE PROCESS: HEALTH-RELATED PESTICIDE INCIDENT REPORT PROGRAM **3**

III. RESULTS **4**

A. Total Health-Related Pesticide Incidents and Cases 4
B. Demographics of Cases: Age, Sex, and Occupation 5
C. Incidents by Month of Occurrence 7
D. Incidents by Parish 8
E. Case Classification 9
F. Circumstance of Health-Related Pesticide Incidents 12
G. Location of Health-Related Pesticide Incidents 16
H. Occupational Health-Related Pesticide Incidents 17
I. Type of Pesticide 18
J. Inert Ingredients of Pesticides 22
K. Environmental Samples 24
L. Route of Exposure 25
M. Symptomatology 26
N. Healthcare Utilization 27
O. Severity of Health Effects 28

IV. RELATED ACTIVITIES **29**

A. Louisiana's Methyl Parathion Program 29
B. Pesticide Behavior Survey 30
C. Louisiana's Registry of Pesticide Hypersensitive Individuals 31

V. DISCUSSION **32**

VI. RECOMMENDATIONS **39**

VII. REFERENCES **40**

VIII. APPENDICES **42**

List of Figures

Figure 1: Health-Related Pesticide Incidents and Cases……4

Figure 2: Health-Related Pesticide Incidents by Month of Occurrence……..7

Figure 3: Health-Related Pesticide Incidents by Parish……..8

Figure 4: Classification of Health-Related Pesticide Incidents and Cases ……..…….11

Figure 5: Health-Related Pesticide Incidents by Circumstance ……..……..…..……..…..12

Figure 6: Health-Related Pesticide Incidents by Type of Pesticide……...18

Figure 7: Route of Exposure by Case Classification……..…25

Figure 8: Symptomatology by Case Classification……26

Figure 9: Healthcare Utilization by Case Classification….……...…27

Figure 10: Severity of Health Effects by Case Classification……..……..28

List of Tables

Table 1: Cases by Age and Sex……..……..…….5

Table 2: Cases by Occupation……..6

Table 3: Parishes with 5 or More Incidents……...……..……....……8

Table 4: Circumstance of Health-Related Pesticide Incidents by Classification of Health Effects…...……13

Table 5: Crops Treated with a Pesticide Resulting in Off-Target Drift…….14

Table 6: Health-Related Pesticide Incidents by Location …...…….……..……...16

Table 7: Type of Pesticide by Classification of Health Effects…….19

Table 8: Active Ingredients Appearing in 5 or More Incidents……...……..20

Table 9: Inert Ingredients by EPA Toxicity List and Number of Appearances…….22

Table 10: LDAF Environmental Sampling by Type of Pesticide..…….2

Abstract

Louisiana's Health-Related Pesticide Incident Report (HRPIR) Program is a complaint-based, statewide surveillance program initiated in 1991. The program's purpose is to investigate and evaluate reported adverse health effects associated with acute pesticide exposure. Pesticides are chemicals designed to kill or repel pests such as insects (insecticides), weeds (herbicides), rodents (rodenticides), or fungi (fungicides). The Louisiana Department of Agriculture and Forestry (LDAF) and the Louisiana Department of Health and Hospitals (LDHH) jointly investigate complaints. A descriptive summary of the HRPIRs investigated from October 1995 through September 2000 is presented in this report.

During the five-year period (October 1995 through September 2000), 163 health-related pesticide incidents involving 336 individuals (cases) were investigated by LDAF and LDHH. Cases were classified according to standard case classification criteria (NIOSH, 2000). Classification categories are based on the degree of association of health effects with the reported pesticide exposure. Classification of 163 incidents by health effects includes 11 confirmed (7%), 28 likely (17%), 83 possible (51%), 27 unlikely (17%), 10 not pesticide-related (6%), and 4 no symptoms reported (2%).

Drift of a pesticide from an aerial or ground application accounted for 87 of the 163 reported incidents (53%). Other frequently reported circumstances of exposure include pest control (23 incidents, or 14%) and household use (17 incidents, or 10%). The location for the majority of health-related pesticide incidents was a residential setting (71%). Of the 163 incidents, 50% involved reported exposure to an insecticide, and 29% involved reported exposure to an herbicide.

Classification of the 336 cases by health effects includes 18 confirmed (5%), 51 likely (15%), 162 possible (48%), 45 unlikely (13 %), 34 not pesticide-related (10%), and 26 no symptoms reported (8%). Cases with health effects associated with pesticide exposure include confirmed, likely, and possible. Forty-nine percent of these cases sought medical care: 17 confirmed, 40 likely, and 56 possible. Eight cases had health effects severe enough to require hospitalization, and there was 1 fatality. Two incidents (6 severe cases and 1 fatality) involved the misuse of a restricted use pesticide in a residential setting.

I. INTRODUCTION

Pesticides are chemicals developed to repel, control, or kill pests, such as insects, weeds, rodents, or fungi. The Louisiana Department of Agriculture & Forestry (LDAF) registers over 11,000 pesticides for use statewide (LDAF, 2002). Some of these products are registered for restricted use, requiring application by certified applicators or people under their supervision, while others are registered for general, household use. Although the majority of pesticides are used on crops, pesticides are also widely used in and around the home, in workplaces, and public places such as schools and parks. The widespread use of pesticides in society has increased the risk of inadvertent pesticide exposure for all segments of the population.

Circumstances resulting in inadvertent exposure to pesticides include drift or overspray, occupational exposure, and household exposure. Drift or overspray occurs when pesticide spray from an airplane, tractor or a home sprayer drifts or blows onto people living, working or going to school near agricultural fields or other application sites. Occupational exposure occurs when a worker, farmworker, applicator, or mixer, touches or inhales a pesticide. Workers may also unknowingly expose their families by carrying pesticides into the home on their bodies and clothes. Household exposure can occur through the improper handling, storage, and application of household pesticides and exposure to residue of pesticide applications made in and around the home. A 1990 survey revealed that 84% of American households use pesticides (Whitmore, 1992). Annually, homeowners use 5 to 10 pounds of pesticide per acre on their lawns and gardens, which is often more than farmers use on their fields (Robinson, 1994).

Health effects associated with pesticide exposure vary according to many factors: pesticide toxicity, dose, duration and frequency of exposure, route of exposure, exposure to other chemicals, and age and health of affected individuals. Acute, or short-term, exposure to organophosphate insecticides, the most widely used category of insecticide, can cause headaches, nausea, diarrhea, respiratory depression, seizures, and loss of consciousness. Acute exposure to herbicides can cause eye and skin irritation, coughing, burning of the throat and lungs, dizziness, nausea, and temporary incoordination. Research also suggests health effects resulting from chronic, or long-term, exposure to some pesticides. Long-term parental exposure to pesticides or application of pesticides in the home has been associated with certain birth defects, and an association has been found between chronic exposure to certain herbicides and cancer (Eskenazi, 1999; Extension Toxicology Network, 1996).

Population-based surveys of pesticide urinary metabolites, or breakdown products, indicate widespread exposure to pesticides. Eighty-two percent of 993 adults tested through the National Health and Nutrition Examination Survey had detectable levels of chlorpyrifos, an organophosphate insecticide, and 20% of 197 Arkansas children had phenoxy herbicide metabolites detected in their urine (Eskenazi, 1999).

Risk of pesticide exposure is particularly high among agricultural workers and their families. A study of household dust and soil from agricultural families and non-farm families indicated a significantly higher amount of organophosphate residues from farm households than non-farm households. In Washington State, 44% of children of pesticide applicators and 27% of non-farm, rural children had detectable organophosphate residues in their urine (Simcox, 1995).

Despite studies documenting pesticide exposure and health effects associated with pesticides, pesticide poisoning in the United States is a commonly under-diagnosed and under-reported illness (U.S. EPA, 1998). In 1992, only 66% of U.S. medical schools required study in occupational and environmental health, with an average of only six hours over four years (Burnstein, 1994). Most pesticide-related diseases have clinical presentations that are similar to common medical conditions and display nonspecific symptoms and physical signs. Unless a healthcare provider is familiar with these conditions, or has a definite report of pesticide exposure, pesticide illness often goes undetected (U.S. EPA, March 1999).

When pesticide poisoning is diagnosed, it is often not properly reported. There are thirty states with rules requiring some form of physician reporting of pesticide-related illnesses. In Louisiana, "each physician who treats a medical complaint which the physician diagnoses as caused by pesticide poisoning shall provide notice of the poisoning to the Commissioner [of Agriculture and Forestry]" (Louisiana Revised Statutes 3:3208). The small number of physician reported cases in Louisiana, however, suggests that most healthcare providers are unfamiliar with the law, or are non-compliant.

The potential underreporting of pesticide-related illnesses has made it difficult to determine their extent in Louisiana and the United States. There is a national effort, however, to improve environmental surveillance. The Healthy People 2000 initiative mandated the need for better environmental surveillance and improved data reporting, collection, and analysis of pesticide illness (U.S. Department of Health & Human Services, 1990). Likewise, in 1994, the American Medical Association adopted a resolution urging Congress, government agencies, and private organizations to support improved strategies for the assessment and prevention of pesticide risks (U.S. EPA, 1998). Consequently, some states have taken measures to create comprehensive surveillance systems to monitor pesticide hazards, exposures, and health outcomes, and target interventions (Maizlish, 1995).

In 1991, the Louisiana Department of Agriculture and Forestry (LDAF) and the Louisiana Department of Health and Hospitals (LDHH) established the Health-Related Pesticide Incident Report (HRPIR) Program. The purpose of this statewide program is to investigate and evaluate adverse health effects associated with acute pesticide exposure occurring in Louisiana. The HPRIR Program is complaint-based: only pesticide exposure incidents reported to LDAF and LDHH are investigated. This report contains a descriptive summary of HRPIR data from October 1995 through September 2000.

II. INVESTIGATIVE PROCESS: HEALTH-RELATED PESTICIDE INCIDENT REPORT PROGRAM

A Health-Related Pesticide Incident Report (HRPIR) is initiated when the Louisiana Department of Agriculture and Forestry Office of Agricultural and Environmental Sciences/ Pesticide and Environmental Programs (LDAF) receives a complaint of health effects possibly associated with pesticide exposure. An LDAF Inspector visits the site of the incident, takes a written statement from the complainant(s) regarding the circumstance of exposure and reported health effects, and collects environmental evidence (e.g., applicator's records, environmental samples). LDAF evaluates the collected information to determine if a pesticide has been misused.

Information collected by LDAF is immediately forwarded to the Louisiana Department of Health and Hospitals Office of Public Health/ Section of Environmental Epidemiology and Toxicology (LDHH). LDHH interviews complainants about the incident, eliciting additional information about the circumstance of exposure and reported health effects. When appropriate, medical records are obtained. Toxicological information from pesticide labels, Material Safety Data Sheets (MSDSs), and health studies are also reviewed. LDHH evaluates the collected information to determine the likelihood that the pesticide(s) caused the reported health effects and evaluates the possibility of long-term health effects associated with the pesticide exposure. LDAF and LDHH each provide the complainant with a final report.

III. RESULTS

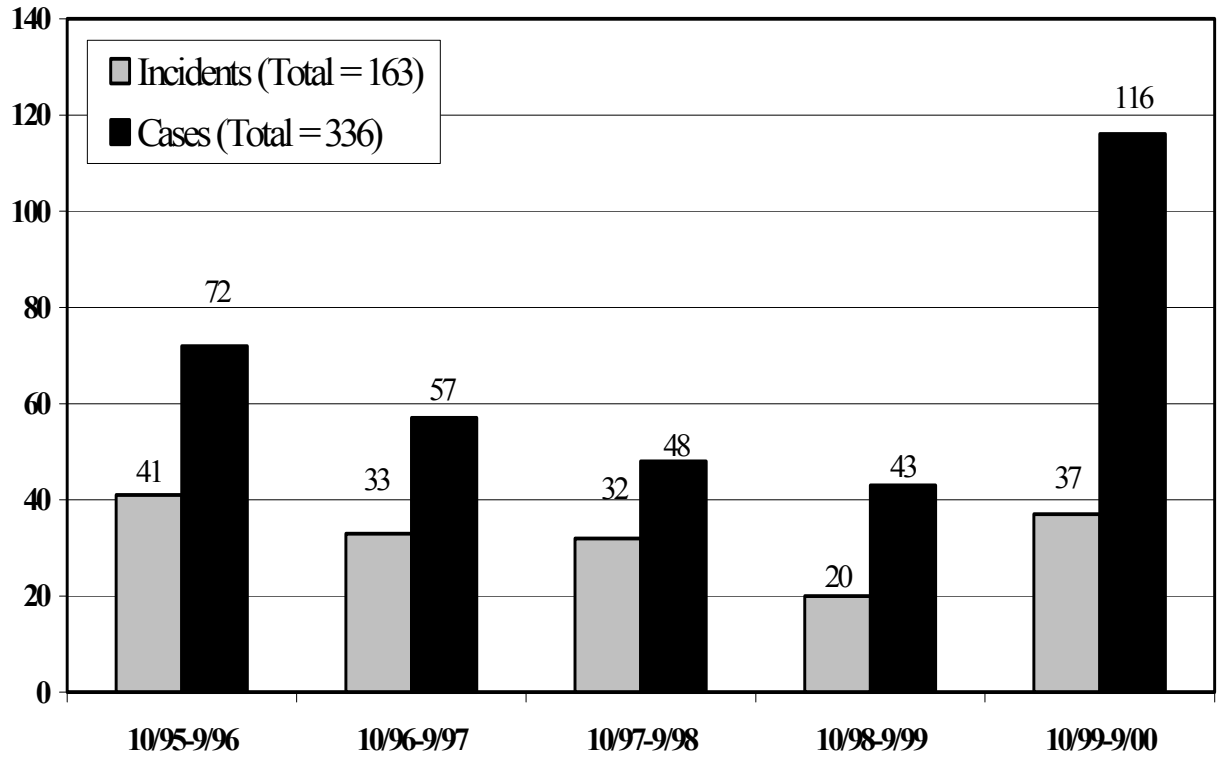
Results represent data from Health-Related Pesticide Incident Reports (HRPIR) filed from October 1995 through September 2000. Data were obtained from LDAF summary reports, HRPIR investigation forms, environmental samples, applicators' records, medical records, and complainants' statements.

Throughout this report, an *incident* is defined as a reported health-related pesticide event affecting at least one person. Each individual affected by a single incident is considered a *case*. Therefore, many cases may be included in one incident. The health effects associated with a reported pesticide exposure are evaluated individually by case.

A. Total Health-Related Pesticide Incidents and Cases

Figure 1 depicts the total number of reported incidents and cases for each year. There were 163 incidents and 336 cases during the five-year period. The number of incidents per year ranged from 20 to 41, and the number of cases ranged from 43 to 116. There was a median of 33 incidents and 57 cases per year. The average number of cases per incident was 2, although 3 incidents involved a large number of cases: 16, 19, and 27.

Figure 1: Health-Related Pesticide Incidents & Cases: October 1995 - September 2000



B. Demographics of Cases: Age, Sex, and Occupation

Table 1 displays the age and sex of the 336 cases.

Table 1: Cases by Age* and Sex: October 1995 - September 2000 (336 Cases)

Age Group	Male	Female	Total	
	Number	**Number**	**Number**	**%**
0 - 4	5	11	16	5
5 - 9	21	11	32	10
10 – 14	18	4	22	7
15 – 19	5	6	11	3
20 – 29	15	14	29	9
30 – 39	19	19	38	11
40 – 49	24	17	41	12
50 – 59	11	25	36	11
60 – 69	14	14	28	8
70 – 79	1	8	9	3
80 – 89	1	2	3	1
Unknown	50	21	71	21
Total	184	152	336	100

* Age is self-reported.

Cases include 184 males (55%) and 152 females (45%). The median age was thirty-five years (range: 1 - 83 years). The majority of cases (55%) were adults over the age of nineteen years, although 16 cases (5%) were less than five years of age. Fifty-six cases (17%) were women of childbearing age (range: 15 – 49 years). Pregnancy status was not routinely obtained, although one woman indicated that she was pregnant at the time of reported pesticide exposure.

As shown in Table 2, of the 336 individuals who filed a HRPIR, the most frequently reported occupations were correctional facility inmates (14%) and homemakers (11%). Other occupational fields often reported were retired (7%), skilled trade (7%), and professional or technical (6%). Eight cases (2%) reported agricultural occupations. Occupation was not reported by 7% of the cases.

Three incidents involved a large number of cases. Two incidents occurred at a correctional facility, and 1 incident occurred at an office building. The correctional facility incidents involved a total of 46 correctional facility inmates. The office building incident involved 16 workers, primarily clerical staff (15 cases).

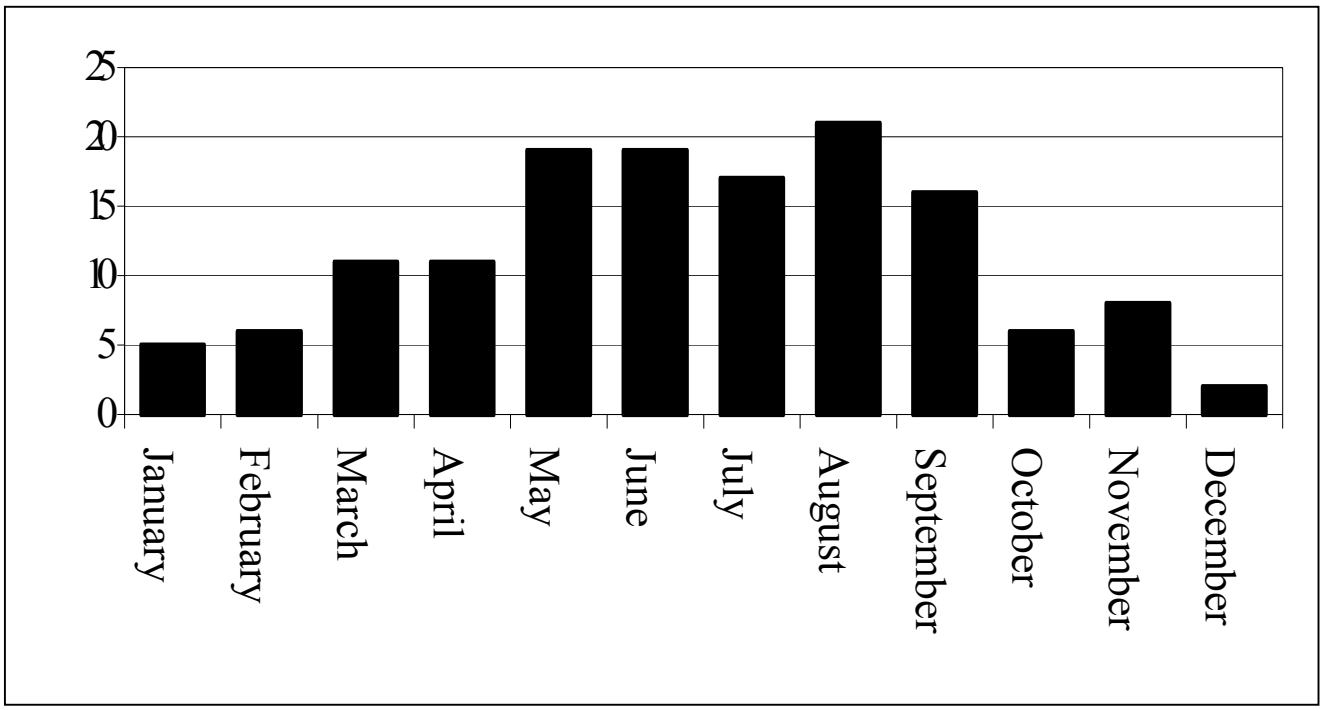
Table 2: Cases by Occupation: October 1995 - September 2000 (336 Cases)

Occupation	Number	%
Correctional Facility Inmate	46	14
Homemaker	36	11
Retired	24	7
Skilled Trade	22	7
Professional/Technical	19	6
Clerical	18	5
Student	11	3
Laborer	10	3
Unemployed	9	3
Agricultural	8	2
Managerial	8	2
Service Industry	5	1
Public Service	3	1
Sales	3	1
Other	16	5
Unknown	23	7
Child < 16 Years	75	22

C. Incidents by Month of Occurrence

Date of pesticide use was known and reported for 141 of the 163 incidents. As shown in Figure 2, the months with the greatest number of reported incidents are May through September: 92 incidents (65%) occurred during these five months.

Figure 2: Health-Related Pesticide Incidents By Month Of Occurrence: October 1995 - September 2000



D. Incidents by Parish

Of Louisiana's 64 parishes, 42 (66%) had at least 1 HRPIR during the five-year period (Figure 3). Jefferson Parish had the highest number of incidents with 16 incidents (Table 3). Ten parishes had between 5 and 9 incidents, and 31 parishes had between 1 and 4 incidents.

Figure 3: Health-Related Pesticide Incidents by Parish: October 1995 - September 2000

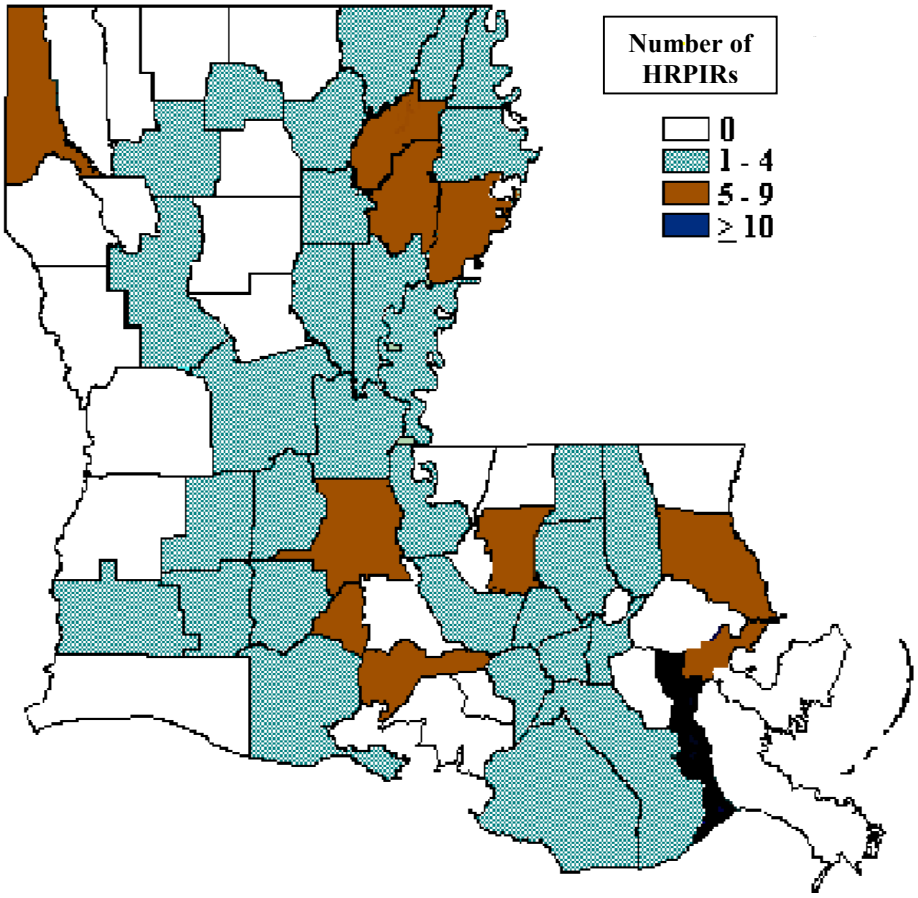


Table 3: Parishes with 5 or More Incidents

Parish	Incidents
	Number
Jefferson	16
E. Baton Rouge	9
St. Landry	9
St. Tammany	8
Franklin	7
Orleans	7
Caddo	6
Iberia	6
Lafayette	6
Richland	6
Tensas	5

E. Case Classification

Cases are classified using the National Institute for Occupational Safety and Health's case definition for acute pesticide-related illness and injury. Classification categories consider the level of certainty of exposure, documentation of health effects, and the plausibility of reported health effects based on the known toxicology of the pesticide(s) (NIOSH, 2000). The strongest evidence of pesticide exposure is confirmation of exposure by environmental or biological samples, and of health effects by medical records.

Case Classification Categories for Acute Pesticide-Related Illness and Injury (NIOSH, 2000):

Confirmed Case

Definition: Health effects confirmed as being associated with pesticide exposure.

Criteria:

1. Laboratory, clinical, or environmental evidence corroborate exposure;
2. New post-exposure abnormal signs* and/or test/laboratory findings reported by a licensed health care provider; and
3. Consistent evidence of a causal relationship between the identified pesticide and the health effects based on the known toxicology of the pesticide.

Likely Case

Definition: Health effects likely associated with pesticide exposure.

Criteria:

1. Laboratory, clinical or environmental evidence corroborate exposure;
2. New post-exposure abnormal symptoms† were reported; and
3. Consistent evidence of a causal relationship between the identified pesticide and the health effects based on the known toxicology of the pesticide.

OR

1. Evidence of exposure based solely upon written or verbal report;
2. New post-exposure abnormal signs* and/or test/laboratory findings reported by a licensed health care provider; and,
3. Consistent evidence of a causal relationship between the identified pesticide and the health effects based on the known toxicology of the pesticide.

Possible Case

Definition: Health effects possibly associated with pesticide exposure.

Criteria:

1. Evidence of exposure based solely upon written or verbal report;
2. New post-exposure abnormal symptoms† were reported; and
3. Consistent evidence of a causal relationship between the identified pesticide and the health effects based on the known toxicology of the pesticide.

* Signs are objective findings that can be observed and described by a licensed healthcare professional.
† Symptoms are any subjective evidence of a disease or condition as perceived and reported by the affected individual.

Unlikely Case

Definition: Health effects unlikely associated with pesticide exposure.

Criteria:

1. Laboratory, clinical or environmental evidence corroborate exposure, or evidence of exposure based solely upon written or verbal report;
2. New post-exposure abnormal signs*, symptoms†, and/or test/laboratory findings were reported; and
3. Evidence of health effects based on pesticide exposure is not present (e.g., exposure dose was insufficient to produce observed health effects, temporal relationship does not exist).

Not Pesticide-Related/Insufficient Information

Definition: Health effects are not pesticide-related, or there is insufficient health and/or exposure data.

Criteria:

1. Definite evidence of a cause other than pesticide exposure; or
2. Insufficient health and/or exposure data to evaluate case's health effects.

No Symptoms Reported

Definition: Health effects were not experienced by the case.

Criteria:

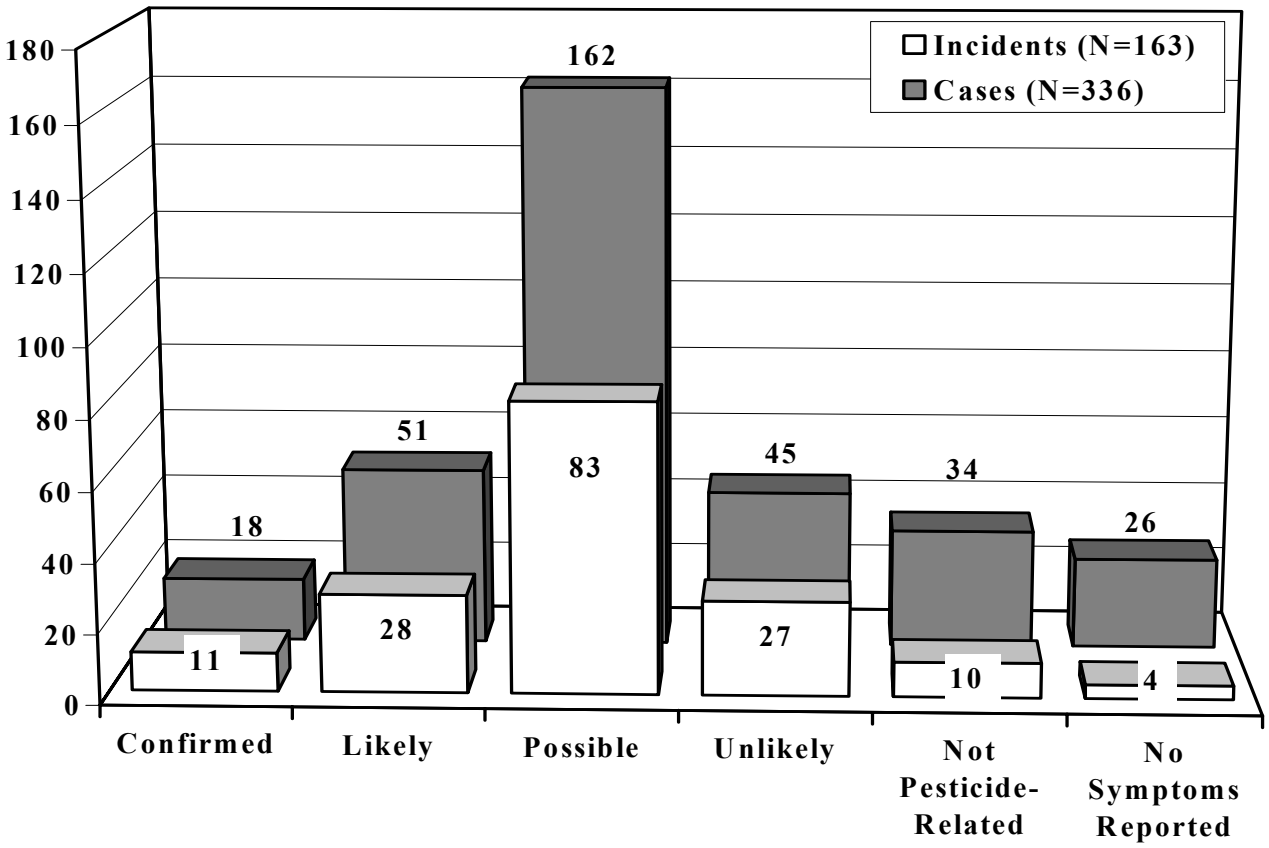
1. No health effects were experienced or reported by the case.

* Signs are objective findings that can be observed and described by a licensed healthcare professional.
† Symptoms are any subjective evidence of a disease or condition as perceived and reported by the affected individual.

Figure 4 categorizes cases and incidents by reported health effects. Of the 336 cases reported from October 1995 through September 2000, 231 (69%) experienced symptoms associated with pesticide exposure. Based on LDHH's case classification system, there were 18 confirmed cases (5%), 51 likely cases (15%), and 162 possible cases (48%). The remaining cases had health effects that were unlikely associated with pesticide exposure (45 cases, 13%), or not pesticide-related/insufficient data (34 cases, 10%). There were no symptoms reported for 26 cases (8%). Incidents with more than one case were classified according to the classification category of the strongest case (i.e., confirmed was the strongest, followed by likely).

In most cases with no symptoms reported, an individual was concerned about potential health effects associated with a pesticide application. For example, concern about a child's health following a termiticide application around the perimeter of a home.

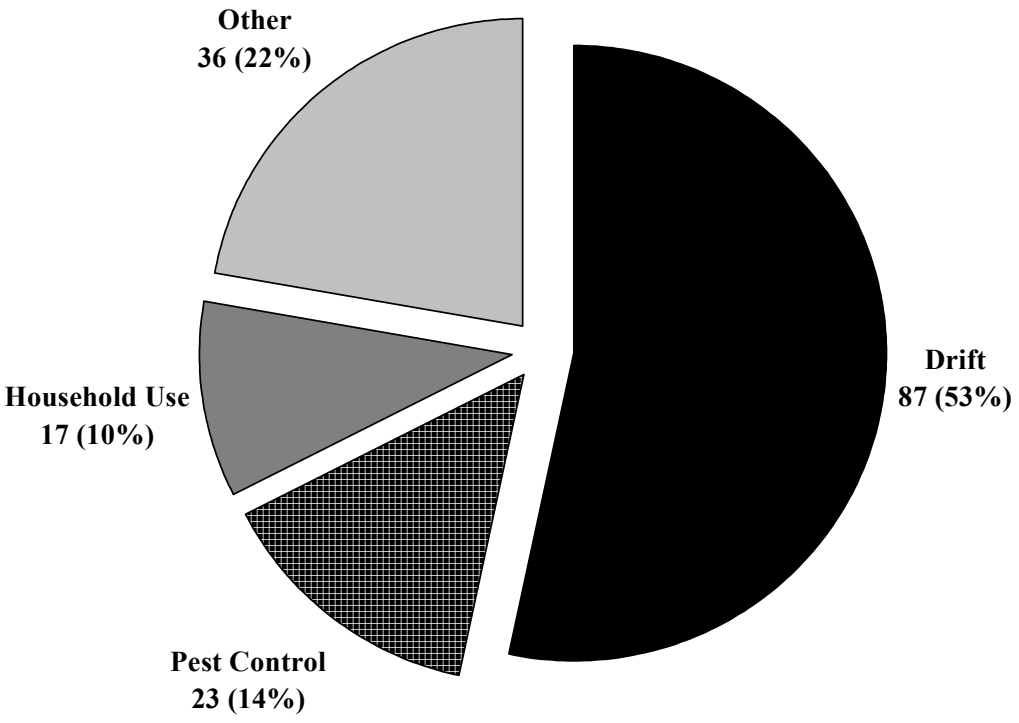
Figure 4: Classification of Health-Related Pesticide Incidents and Cases: October 1995 - September 2000



F. Circumstance of Health-Related Pesticide Incidents

Figure 5 represents incidents by circumstance of reported exposure. Circumstance refers to how a person came into contact with or was exposed to a pesticide.

Figure 5: Health-Related Pesticide Incidents by Circumstance: October 1995 – September 2000 (163 Incidents)



The majority (53%) of incidents involved the drift of a pesticide either from an aerial (72 incidents/163 cases) or ground application (15 incidents/18 cases). Pesticide drift refers to the uncontrolled airborne movement of spray droplets, vapors, or dust particles away from the intended point of application (Bellinger, 1996). For non-drift incidents, circumstances of reported exposure include pest control (23 incidents/68 cases), household use (17 incidents/33 cases), and 'other' (36 incidents/54cases).

Table 4 displays circumstance of health-related pesticide incidents by classification of health effects.

Table 4: Circumstance of Health-Related Pesticide Incidents by Classification of Health Effects: October 1995 – September 2000 (163 Incidents)

Classification of Health Effects	Circumstance of Health-Related Pesticide Incidents							
	Drift		Pest Control Applications		Household Use		Other	
	Number	%	Number	%	Number	%	Number	%
Confirmed	1	1	1	4	5	29	4	11
Likely	17	20	5	22	3	18	3	8
Possible	56	64	11	48	6	35	10	28
Unlikely	8	9	3	13	1	6	15	42
Not Pesticide-Related	3	3	1	4	2	12	4	11
No Symptoms Reported	2	2	2	9	0	-	0	-
TOTAL	87		23		17		36	

Circumstance of Health-Related Pesticide Incidents: Drift

There were 87 health-related pesticide incidents involving pesticide drift. Classification of incidents by health effects includes 1 confirmed, 17 likely, 56 possible, 8 unlikely, 3 not pesticide-related, and 2 no symptoms reported. Seventy-four incidents (1 confirmed, 17 likely, and 56 possible) were determined by LDHH to involve cases who had health effects associated with pesticide exposure. Of these 74 incidents, drift occurred from either an aerial application (62 incidents) or ground application (12 incidents). Eighty-six percent (64 incidents) of the drift incidents resulted from the use of a pesticide for agricultural purposes, and 11% of drift incidents (8 incidents) involved the use of a pesticide on a right-of-way. The remaining drift incidents involved drift from a ground application made to a golf course and drift from a residential application onto neighboring property.

The LDHH determined that the remaining 13 incidents did not involve cases who developed health effects associated with pesticide exposure. Two incidents involved a fertilizer application, 2 incidents did not involve any reported symptoms, and 1 incident had insufficient information. The remaining 8 incidents were classified as unlikely due to lack of temporal association between reported exposure and health effects or insufficient exposure to cause reported health effects.

Sixty-four drift incidents classified as confirmed, likely, or possible involved the use of a pesticide for agricultural purposes. Table 5 reflects the target crops of these 64 drift incidents.

Table 5: Crops Treated with a Pesticide Resulting in Reported Off-Target Drift: October 1995 – September 2000 (64 Incidents*)

Crop Treated	Number	%
Cotton	23	36
Sugar cane	14	22
Rice	8	13
Soybean	7	11
Corn	3	5
Forest	2	3
Pecan	2	3
Unknown	5	8

*Only includes agricultural drift incidents classified as confirmed, likely, or possible.

As shown, aerial pesticide applications to cotton crops were responsible for 36% of agricultural drift incidents, followed by applications to sugar cane (22%), rice (13%), and soybean (11%).

Circumstance of Health-Related Pesticide Incidents: Pest Control

Pest control captures applications made by an applicator (licensed or unlicensed) in or around a building to control for pests such as cockroaches and termites. Of the 23 pest control incidents, there were 1 confirmed, 5 likely, 11 possible, 3 unlikely, 1 not pesticide-related, and 2 no symptoms reported. Two of the unlikely incidents involved reported methyl parathion exposure in a household setting.

Of the 17 incidents classified as confirmed, likely, or possible, 88% (15 incidents) occurred in a residential area. The majority of incidents (83%) classified as confirmed or likely involved exposure resulting from a termiticide application by a licensed Pest Control Operator.

Circumstance of Health-Related Pesticide Incidents: Household Use

Household use refers to exposures resulting from the application of a pesticide by a resident, neighbor, or family member to a resident's home, property, or personal effects. Of the 17 incidents resulting from the household use of a pesticide, there were 5 confirmed, 3 likely, 6 possible, 1 unlikely, and 2 not pesticide-related. Household exposures resulted in the highest proportion of confirmed incidents (29%). Two of the confirmed incidents involved the misuse of a restricted use pesticide in a residential setting.

Circumstance of Health-Related Pesticide Incidents: Other

There were 36 incidents in the category 'other' including 4 confirmed, 3 likely, 10 possible, 15 unlikely, and 4 not pesticide-related. The circumstance of exposure was unclear for 58% of the unlikely or not pesticide-related incidents. In most instances, cases complained of chronic health problems of unknown origin.

The circumstance of reported exposure for the 4 confirmed incidents include disposal, transport, landscaping, and exposure to an unknown source of chlordane in a residential neighborhood. Commonly occurring circumstances of exposure for the remaining likely and possible incidents include unintentional ingestion of a pesticide-contaminated product (4 incidents) and exposure resulting from an occupationally related application of a pesticide (4 incidents).

G. Location of Health-Related Pesticide Incidents

The location of health-related pesticide incidents refers to the place where the person reported exposure to a pesticide or experienced symptoms possibly associated with pesticide exposure. As shown in Table 6, the location for the majority of incidents was residential (71%): home, yard, or other residential setting.

Table 6: Health-Related Pesticide Incidents by Location: October 1995 – September 2000 (163 Incidents)

Location	Number	%
Residential Setting: Home, Yard	115	71
Agricultural Field	14	9
Road/Freeway	13	8
Bayou/Pond/Lake	7	4
Office/Business/School	5	3
Other	7	4
Unknown	2	1

H. Occupational Health-Related Pesticide Incidents

During the five-year period, there were 30 occupational health-related pesticide incidents involving 52 cases. Incidents are considered occupationally related if reported pesticide exposure occurred while working. Work-related incidents include reported exposures occurring on employer premises, work for a family business, travel on business, and work for pay or compensation at home. Classification of the reported occupationally related incidents and cases is as follows: confirmed (2 incidents/3 cases), likely (7 incidents/12 cases), possible (13 incidents/29 cases), unlikely (6 incidents/6 cases), and not pesticide-related/insufficient information (2 incidents/2cases).

Based on the case classification criteria, 44 cases (22 incidents) had health effects associated with pesticide exposure (confirmed, likely, and possible). Of these 44 cases, exposure to a pesticide resulting from aerial drift or direct spray accounted for 19 cases (13 incidents). Common occupational activities resulting in exposure to pesticide drift or direct spray include levee/road maintenance (7 cases), agricultural work (5 cases), and boll weevil trapping (4 cases). The agricultural workers were all exposed to pesticide drift from a neighboring field, not the field where they were working. One incident involved 17 cases exposed to an insecticide applied inside an office building. Remaining occupational exposures include several sanitation workers exposed to pesticides in garbage they were collecting, pesticide application, and pet grooming. The 8 occupational incidents classified as unlikely or not pesticide-related/insufficient information involved reported pesticide exposure by construction workers and office workers.

I. Type of Pesticide

Figure 6 categorizes incidents by type of pesticide. Fifty percent of the incidents involved insecticides, and 29% of the incidents involved herbicides. No pesticide was identified for 12% of the incidents.

Figure 6: Health-Related Pesticide Incidents by Type of Pesticide: October 1995 – September 2000 (163 Incidents)

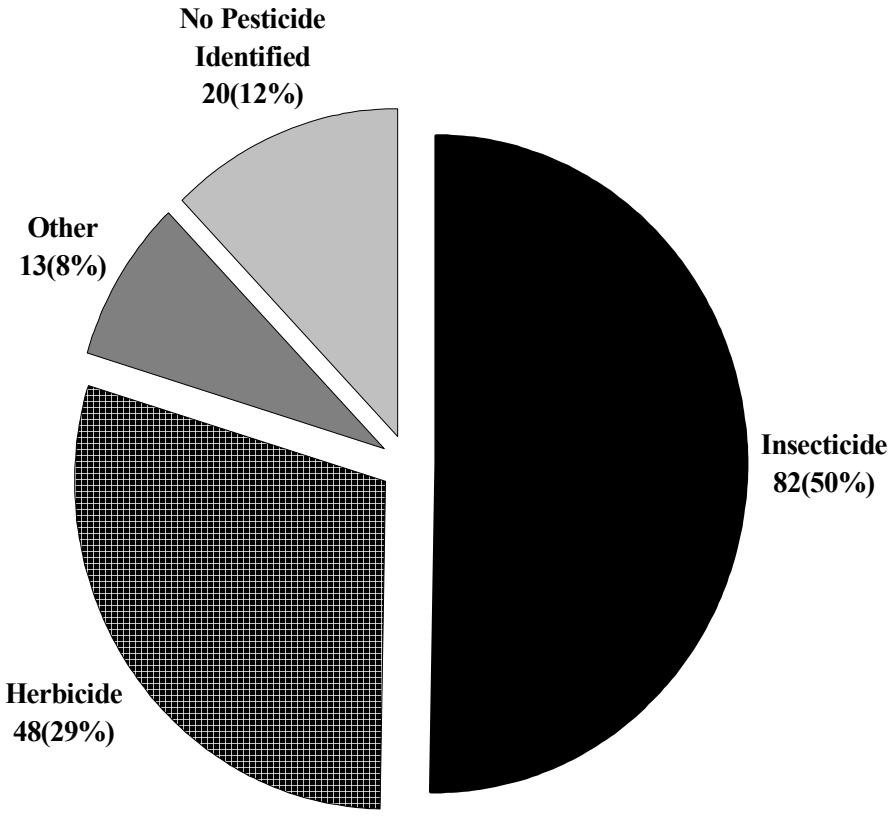


Table 7 presents health-related pesticide incidents by the type of pesticide and classification of health effects.

Table 7: Type of Pesticide by Classification of Health Effects: October 1995 – September 2000 (163 Incidents)

Classification of Health Effects	Type of Pesticide							
	Insecticide		Herbicide		Other		No Pesticide Identified	
	Number	%	Number	%	Number	%	Number	%
Confirmed	8	10	1	2	2	15	0	-
Likely	19	23	7	15	2	15	0	-
Possible	42	51	34	71	7	54	0	-
Unlikely	8	10	3	6	1	8	15	75
Not Pesticide-Related	2	2	2	4	1	8	5	25
No Symptoms Reported	3	4	1	2	0	-	0	-
TOTAL	82		48		13		20	

Insecticides accounted for the majority of health-related pesticide incidents. Of the 82 incidents involving an insecticide, classification by health effects includes 8 confirmed incidents, 19 likely incidents, and 42 possible incidents. These 69 incidents were categorized according to the insecticides' active ingredients. The active ingredients for the majority of insecticides were cholinesterase-inhibitors, either organophosphates (44 incidents, or 64%) or carbamates (5 incidents, or 7%). The remaining insecticides include pyrethrins/pyrethroids (15 incidents, or 22%), organochlorines (2 incidents, or 3%), or other (3 incidents, or 4%).

Forty-two of 48 herbicide incidents (88%) had health effects associated with pesticide exposure: 1 confirmed, 7 likely, and 34 possible. The category 'other' includes fungicides (5 incidents), fumigants (4 incidents), rodenticides (2 incidents), mildewicide (1 incident), and a

plant growth regulator (1 incident). Exposure to fumigants (aluminum phosphide and methyl bromide) resulted in 2 confirmed incidents. The likely incidents involved exposure to a fumigant and exposure to a fungicide.

Type of Pesticide: Active Ingredients

Of the 122 incidents classified as confirmed, likely, or possible, 52 incidents involved more than one active ingredient. Incidents with multiple active ingredients include one product with several active ingredients or several different products. Multiple active ingredient incidents usually involve a combination of two insecticides or two herbicides, although one incident involved the use of an insecticide and a fungicide. Two incidents involved the use of three herbicides.

Table 8 lists the active ingredients of insecticides and herbicides that appeared in five or more incidents classified as confirmed, likely, or possible. To reflect the use of more than one active ingredient in an incident, the table also lists the total number of occurrences for the active ingredient, as well as the number of times it occurred alone, and in combination with another active ingredient.

Table 8: Active Ingredients Appearing in 5 or More Incidents Classified as Confirmed, Likely, Possible: October 1995 – September 2000

Active Ingredient	Chemical Class	Total Occurrences	Pesticide Used Alone		Pesticide Used in Combination with Other Pesticide(s)	
		Number	Number	%	Number	%
Insecticides						
Methyl Parathion	Organophosphate	17	14	82	3	18
Chlorpyrifos	Organophosphate	16	11	69	5	31
Malathion	Organophosphate	9	9	100	0	-
Lambda Cyhalothrin	Pyrethroid	6	2	33	4	67
Total		***48***	***36***	***75***	***12***	***25***
Herbicides						
Glyphosate	Phosphonate	16	9	56	7	44
2,4-D	Chlorophenoxy	12	3	25	9	75
Molinate	Thiocarbamate	8	2	25	6	75
Atrazine	Triazine	6	1	17	5	83
Dicamba	Benzoic	5	0	-	5	100
Total		***47***	***15***	***32***	***32***	***68***

The three most commonly occurring insecticides (methyl parathion, chlorpyrifos, and malathion) are all organophosphate insecticides. Organophosphates are the most widely used class of insecticides, both for agricultural and non-agricultural purposes. The fourth most commonly occurring insecticide is lambda cyhalothrin, a synthetic pyrethroid. Pyrethroids are also commonly used insecticides, and they are less toxic than organophosphates.

There are a large number of herbicides available for use in agriculture, and lawn and garden weed control. The HRPIR data from October 1995 through September 2000 revealed that the five most commonly occurring herbicides contain active ingredients from five different chemical classes: phosphonate (glyphosate), chlorophenoxy (2,4-D), thiocarbamate (molinate), triazine (atrazine), and benzoic acid (dicamba).

J. Inert Ingredients of Pesticides

Inert ingredients are materials used in pesticide formulations that have no direct pesticidal activity against the target pest. They may be solvents, propellants, surfactants, emulsifiers, or carriers. Inerts are often toxic; they may sometimes be the most toxic component of a pesticide product. Unless an inert ingredient is determined to be highly toxic, Federal law does not require that pesticide product labels identify inert ingredients by name and percentage. The U.S. Environmental Protection Agency did attempt to elucidate the potential toxicity of inert ingredients by issuing a notice to pesticide manufacturers encouraging them to substitute the term "other ingredients" for "inert ingredients." This followed a consumer survey that found that many consumers are misled by the term "inert ingredient," believing it to mean "harmless" (U.S. EPA, 1997).

Table 9 displays the inert ingredients listed on product labels or MSDSs identified in the investigation of 122 incidents classified as confirmed, likely, or possible. Of these incidents, inert ingredients were identified in 2 confirmed cases, 11 likely cases, and 20 possible cases.

Table 9: Inert Ingredients by EPA Toxicity List and Number of Appearances: October 1995 – September 2000 (56 Appearances)

Inert Ingredient	EPA Toxicity List*	Number of Appearances
aromatic hydrocarbon	2	3
ethylbenzene	2	3
cyclohexane	2	1
diethanolamine	2	1
Xylene	2	13
1,2,4- trimethylbenzene	3	7
Cumene	3	1
dimethylamine	3	1
ethylene glycol	3	3
ethylenediamine tetra	3	1
kerosene	3	1
naphthalene	3	5
n-methyl-2-pyrrolidone	3	1
triethylamine	3	3
1-butanol	4	1
isopropanol	4	2
propylene glycol	4	2
Ethanol	4	3
kaolin clay	4	4
TOTAL		**56**

* The U.S. EPA Toxicity List categorizes inerts into 4 different 'Lists' depending on their toxicity to humans and the environment: List 1: Inerts of toxicological concern; List 2: Potentially toxic inerts, with high priority for testing; List 3: Inerts of unknown toxicity; and, List 4: Inerts of minimal concern (U.S. EPA, 1995).

There were a total of 21 inerts from List 2 (Potentially Toxic Inert), 23 inerts from List 3 (Inerts of Unknown Toxicity), and 12 inerts from List 4 (Inerts of Minimal Concern). Of all the inert ingredients identified, xylene, a potentially toxic inert, was the most common. Five cases (4 incidents) had health effects possibly associated with an inert ingredient, and 1 case had confirmed health effects associated with an inert.

K. Environmental Samples

LDAF Inspectors often collect environmental samples during their investigation of health-related pesticide incidents. Because sunlight, bacteria, and other processes quickly break down most insecticides and herbicides, samples are only collected if the complaint has been filed shortly after the date of reported incident. If a complaint is filed weeks or months after the incident, environmental samples are usually not collected because the pesticide will have degraded to a non-detectable level.

Environmental samples usually consist of a swab collected from a surface likely to contain pesticide residue such as the side of a building, top of a car, or interior floor surface. In some cases, foliage or clothing is analyzed for pesticide residue. Depending on the circumstance of the health-related pesticide incident, samples have several purposes: they can be used to verify an off-target drift, identify pesticide(s), and provide an indication of the amount of pesticide involved in an incident. For herbicides, visual evidence of damage on plants is also used to corroborate the presence of a pesticide. Table 10 depicts the number of environmental samples LDAF collected by type of pesticide.

Table 10: LDAF Environmental Sampling by Type of Pesticide: October 1995 – September 2000 (163 Incidents)

	Environmental Samples Collected		No Environmental Samples Collected		Total Incidents
Type of Pesticide	**Number**	**%**	**Number**	**%**	**Number**
Insecticide	60	73	22	27	82
Herbicide	17	35	31	65	48
Fungicide	1	20	4	80	5
Fumigant	1	25	3	75	4
Rodenticide	1	50	1	50	2
Other	2	50	2	50	4
Missing	5	28	13	72	18
Total	**87**	**53**	**76**	**47**	**163**

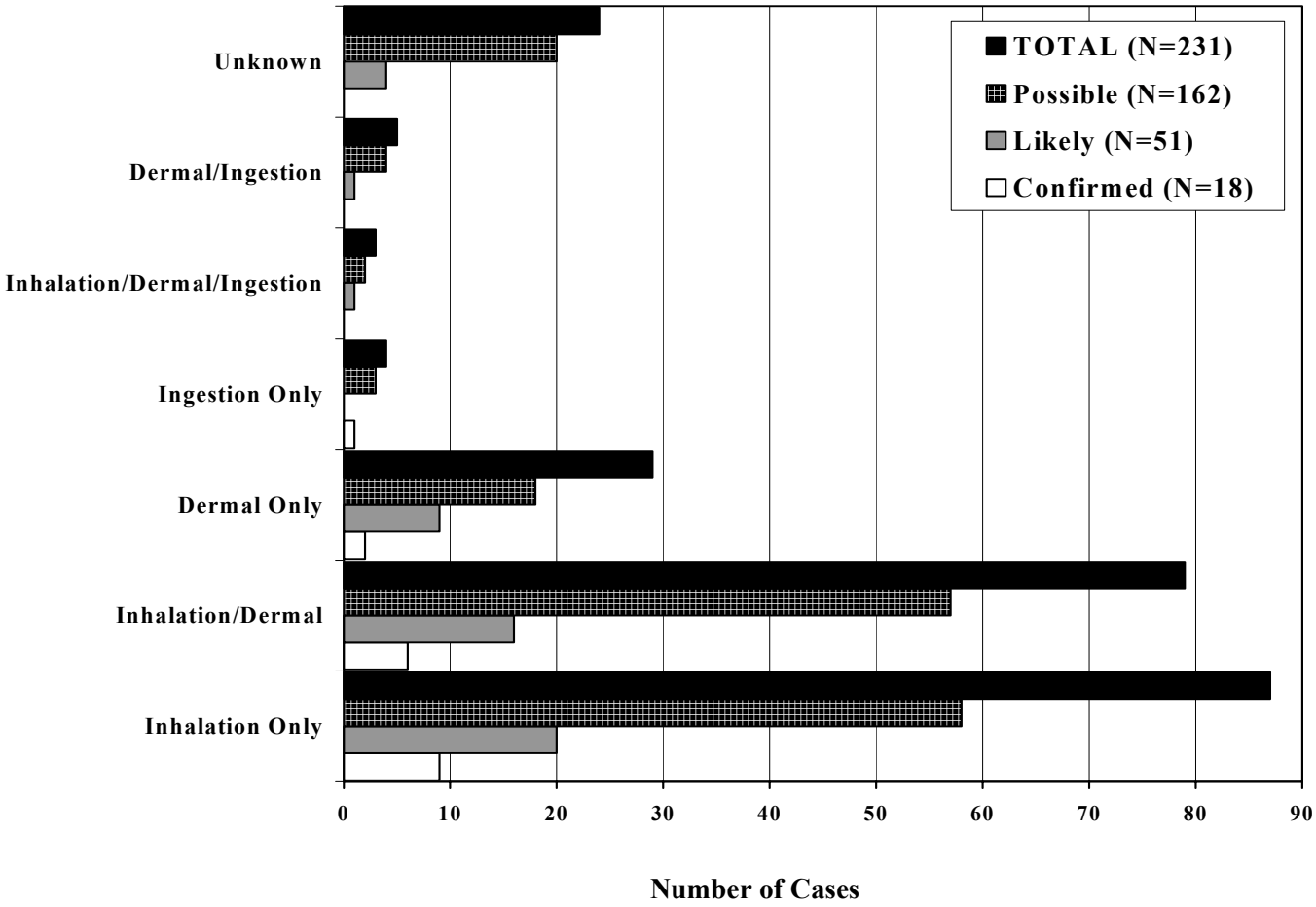
As shown in Table 10, environmental samples were collected for 53% of incidents. Because visual symptoms of herbicide damage on plants are often used instead of samples, incidents involving the application of an insecticide were more likely to have samples collected than incidents involving a herbicide: 73% versus 35%, respectively.

L. Route of Exposure

A chemical can enter the body through three routes of exposure - inhalation, ingestion, and dermal (skin penetration). The route a chemical enters the body influences the type and severity of health effects. For example, organophosphates (e.g., chlorpyrifos, methyl parathion) are absorbed into the body through all routes of exposure whereas other insecticides such as synthetic pyrethroids are less readily absorbed through the skin. Exposure to a chemical through multiple routes of exposure can also influence the severity of the health effects.

Cases with health effects associated with reported pesticide exposure (18 confirmed, 51 likely, and 162 possible) were categorized by route of exposure. As depicted in Figure 7, most cases came in contact with a pesticide either by inhaling it (87 cases, or 38%) or by inhalation and dermal contact (79 cases, or 34%). Thirteen percent of the cases were exposed solely through dermal contact (29 cases). Ingestion was relatively uncommon.

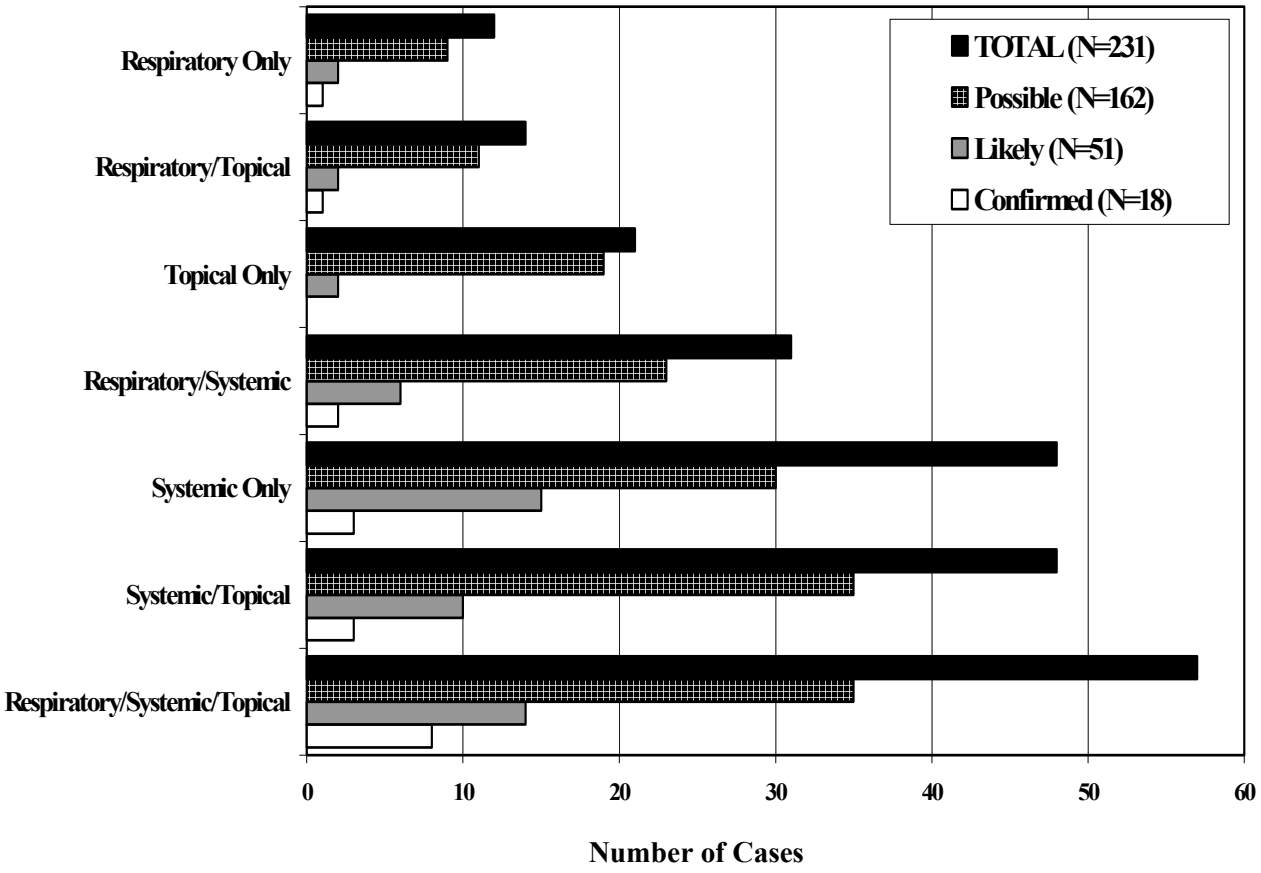
Figure 7: Route(s) of Exposure by Case Classification (Confirmed, Likely, and Possible): October 1995 – September 2000 (231 Cases)



M. Symptomatology

Reported symptoms were obtained from several sources: medical records, interviews with complainants, and LDAF Inspectors' reports. Symptoms were classified into three categories: respiratory, systemic, and topical. Respiratory symptoms include symptoms resulting from inhalation of a chemical such as irritation to the upper respiratory tract. Systemic symptoms include symptoms that are referable to more than one organ system. Topical symptoms include irritation to the eyes or skin.

Figure 8: Symptomatology by Case Classification (Confirmed, Likely, and Possible): October 1995 – September 2000 (231 Cases)

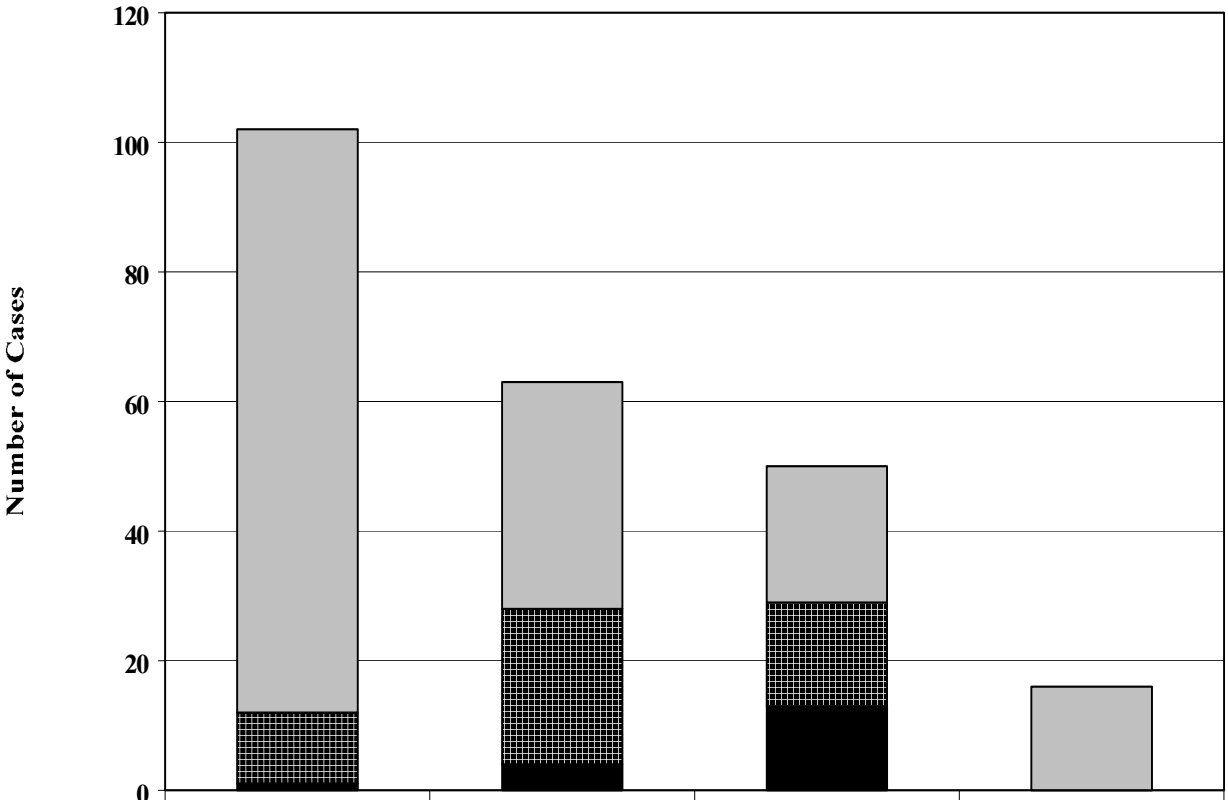


As shown in Figure 8, the majority of cases with health effects associated with pesticide exposure (18 confirmed, 51 likely, and 162 possible) reported systemic health effects either alone (48 cases, or 21%), in combination with respiratory and topical health effects (57 cases, or 25%) or in combination with topical effects (48 cases, or 21%). The most commonly reported systemic symptom was headache, followed by nausea.

N. Healthcare Utilization

Cases were categorized according to healthcare utilization: emergency room visit, clinic visit, or no medical care sought. Clinic visit represents a non-emergency room visit made by a case following exposure to a pesticide. Unlike emergency room visits, which usually occur immediately after exposure to a pesticide, clinic visits may occur several days or weeks after the exposure incident.

Figure 9: Healthcare Utilization by Case Classification (Confirmed, Likely, and Possible): October 1995 – September 2000 (231 Cases)



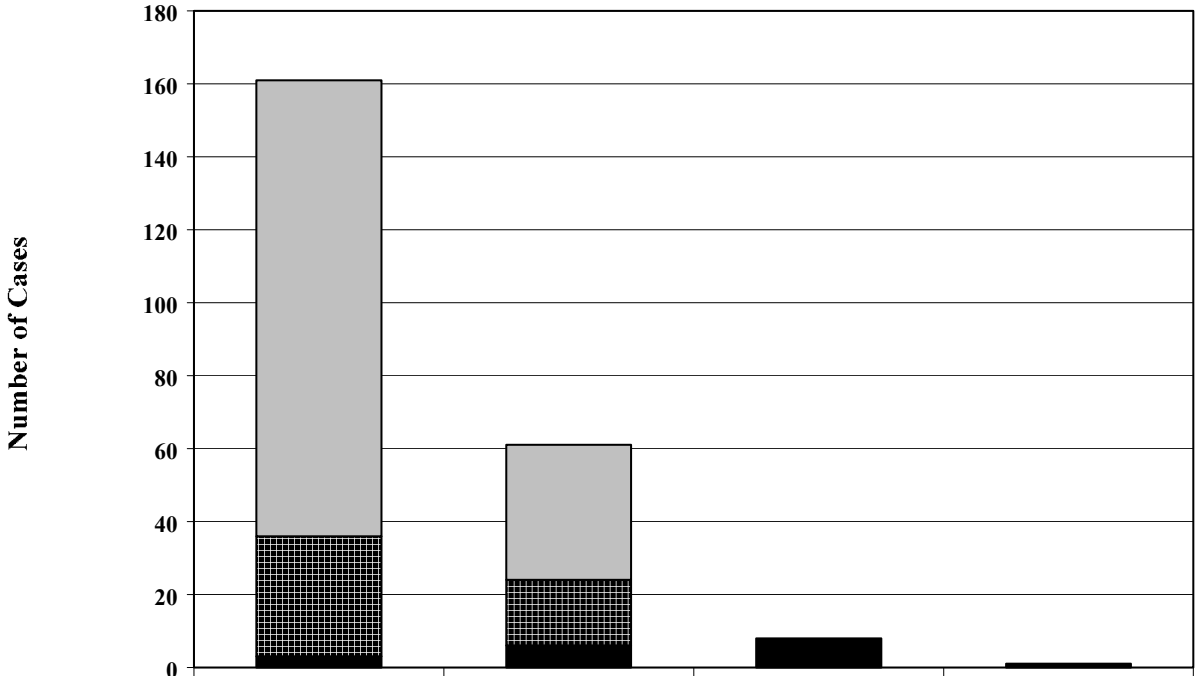
	No Medical Care Sought	Clinic Visit	Emergency Room	Unknown
Possible (N=162)	90	35	21	16
Likely (N=51)	11	24	16	0
Confirmed (N=18)	1	4	13	0

As depicted in Figure 9, 22% of the cases sought emergency medical care following exposure (50 cases), and 27% had a clinic visit (63 cases). Forty-four percent of the cases did not seek any medical care (102 cases). Exposure to an insecticide was more likely to result in an emergency room or clinic visit than exposure to an herbicide (56% versus 40%, respectively).

O. Severity of Health Effects

Cases were categorized according to the severity of their health effects: mild, moderate, severe, and fatal. Severe refers to systemic health effects requiring aggressive medical treatment or hospitalization and topical burns, ulceration, or irritations resulting in medical treatment. Moderate health effects typically resolve without medical treatment and are of short duration, and mild health effects are minimally bothersome and rapidly resolved.

Figure 10: Severity of Health Effects by Case Classification (Confirmed, Likely, and Possible): October 1995- September 2000 (231 Cases)



	Mild	Moderate	Severe	Fatal
Possible (N=162)	125	37	0	0
Likely (N=51)	33	18	0	0
Confirmed (N=18)	3	6	8	1

Figure 10 shows that 161 (70%) cases experienced mild health effects, 61 cases (26%) experienced moderate effects, and 8 cases (3%) had severe health effects. There was 1 fatality. The misuse of a restricted use pesticide in a household setting was responsible for the fatal and 6 severe cases. The remaining severe cases involved a residential flea control application and a household pesticide misapplication. All of the severe cases required emergency medical treatment.

IV. RELATED ACTIVITIES

A. Louisiana's Methyl Parathion Program

Louisiana's Methyl Parathion Program was a statewide program created in 1996 following the discovery of a large number of residences sprayed with methyl parathion, a restricted use organophosphate insecticide. Methyl parathion was illegally sprayed indoors to kill cockroaches and other pests, resulting in harmful pesticide exposure for thousands of Louisiana residents. The potential public health hazard required the intervention of the U.S. Environmental Protection Agency, the Agency for Toxic Substances and Disease Registry, the U.S. Army Corps of Engineers, the Louisiana Department of Health and Hospitals, and the Louisiana Department of Agriculture and Forestry. The program was in effect in Louisiana from November 1996 through July 1999.

Under the Methyl Parathion Program, 1865 residences were environmentally sampled for methyl parathion. Thirty-four percent of these residences (626 residences) had environmental samples indicating the presence of methyl parathion inside their homes. Of these 626 residences with methyl parathion detected inside their homes, 186 residences (30%) were subsequently renovated. Biological sampling for exposure to the insecticide was conducted on 1246 individuals. Thirty-five percent of sampled individuals had a metabolite in their urine indicating exposure to methyl parathion. A number of residents complained of symptoms consistent with exposure to methyl parathion, however, no serious health effects were reported. Residents who participated in the Methyl Parathion Program received educational materials about pest control, health effects associated with methyl parathion exposure, and facts about urine sampling for methyl parathion.

Data from the Methyl Parathion Program are not included in the report Summary of Health-Related Pesticide Incidents Reported in Louisiana from October 1995 through September 2000. Complaints of health effects associated with indoor exposure to methyl parathion received after July 1999 were handled as Health-Related Pesticide Incident Complaints.

B. Pesticide Behavior Survey

As a follow-up to Louisiana's Methyl Parathion Program, in 1998, the Louisiana Department of Health and Hospitals conducted a telephone survey of 200 Louisiana residents to assess pesticide use behaviors associated with health risks. Survey results indicate that pesticide use around the home is very common: 86% of respondents reported using "preventive pesticides," 79% used cockroach sprays, 96% used disinfectants, and 50% used herbicides.

High risk pesticide behaviors identified were 1) the use of outdoor pesticides inside the home (19%), 2) not always reading the label before purchasing a new type of cockroach spray (50%), and 3) receiving a pesticide in an unmarked jar or container from a neighbor, friend, or relative (11%). Sixty percent of respondents indicated that they store pesticides in unlocked cabinets near the floor or in cabinets under the sink, a risk factor for household pesticide poisoning in children.

C. Louisiana's Registry of Pesticide Hypersensitive Individuals

In 1989, the Louisiana Department of Agriculture and Forestry (LDAF) and the Louisiana Department of Health and Hospitals (LDHH) established the Registry of Pesticide Hypersensitive Individuals. The registry's purpose is to enable pesticide hypersensitive individuals to receive prior notification of pesticide applications in the vicinity of their home. With prior notification, individuals can take necessary precautions to protect themselves from inadvertent pesticide exposure. There is no charge for inclusion on the registry, but a Louisiana physician must certify that the registrant is hypersensitive to pesticides. Applications for the registry are available from LDAF and LDHH.

The registry's list, which is annually updated, is provided to all licensed applicators and pest control operators. Applicators and operators are requested to notify registrants prior to making a pesticide application to a property within one hundred feet or adjacent to the registrant's property. Notification by applicators and operators is voluntary, and there is no penalty for non-compliance.

In 1999, LDHH conducted a telephone survey of all registrants to evaluate their satisfaction with the registry. Of the 62 households on the registry, 37 (60%) participated in the survey. Results indicated that 62% of the surveyed registrants live in a rural area of which 49% live on a farm. Forty-one percent of the households were notified every time there was a pesticide application within one hundred feet or adjacent to their property, 32% were sometimes notified, and 27% were never notified. Fifty-seven percent of the households reported a pesticide application to crops within one hundred feet or adjacent to their property, and 27% reported residential applications.

Overall, 62% of the surveyed registrants were satisfied with the registry, although 76% of the registrants believed that one hundred feet was not a sufficiently protective distance. All surveyed registrants stated that they would be willing to pay a small fee in exchange for mandatory notification by applicators.

V. DISCUSSION

During a five-year period (October 1995 through September 2000), there were 163 Health-Related Pesticide Incident Reports (HRPIR) involving 336 cases investigated by the Louisiana Department of Agriculture and Forestry (LDAF) and the Louisiana Department of Health and Hospitals (LDHH). The investigation of HRPIRs involves an in-depth review of environmental and health data associated with each incident. Analysis of the data illustrates the types of reported pesticide exposures occurring in Louisiana.

Report Data

The small number of reported annual incidents, approximately 33 per year, is likely an underestimate of the actual number of pesticide exposure incidents occurring in the state. Data from the Louisiana Poison Control Center suggest that the number of HRPIRs is a small fraction of the actual number of pesticide poisoning incidents in Louisiana. Louisiana Poison Control Center data indicate that during an eight-month period, October 1999 through May 2000, there were 301 calls regarding unintentional human pesticide exposure. This number only includes individuals exposed to an organophosphate, carbamate, or pyrethrin/pyrethroid insecticide (Louisiana Poison Control Center, 2000). Although the Louisiana Pesticide Law requires physicians who treat a medical complaint diagnosed as caused by pesticide poisoning to provide notice of the poisoning to LDAF, many cases of pesticide illness are not reported (Louisiana Revised Statutes. 3:32-8). Most HRPIRs are initiated by the complainant, not physician-referred.

In addition to an underreporting of incidents, the fluctuation in reported incidents over the five-year period is difficult to assess without an active surveillance system routinely capturing data from several sources. The complaint-based nature of the HRPIR program is dependent on many individual factors such as knowledge of how to file a HRPIR, willingness to file a complaint, and recognition of pesticide exposure. The increase in the number of reported incidents during summer months likely reflects a seasonal increase in agricultural pesticide applications, especially insecticide applications.

Demographics

HRPIRs were received from all areas of the state, although one-third of the parishes did not report any health-related pesticide exposure incidents during the five-year period. Jefferson Parish had the greatest number of HRPIRs. Almost half of the incidents reported in Jefferson Parish involved residential pesticide applications, including 2 incidents occurring after July 1999 that involved indoor methyl parathion applications made by an unlicensed applicator. Complaints of indoor methyl parathion exposure received from November 1996 through July 1999 were handled through the Louisiana Methyl Parathion Program, not the HRPIR Program.

Two incidents involved the reported aerial drift of pesticides onto inmates in the recreational yard of a correctional facility. These incidents involved 46 cases, all correctional facility inmates. In addition to correctional facility inmates, demographic data reveal that homemakers (11%), retirees (7%), and children less than sixteen years of age (22%) were the sub-populations most likely to report pesticide exposure. This finding accords with the location

of exposure for the majority of incidents: home, yard, or other residential setting. Homemakers, retirees, and children are more likely to be at home during daytime hours when pesticide applications typically occur.

There were 16 children under the age of five and 56 women of childbearing age who reported exposure to pesticides. Childhood pesticide exposures are of particular concern because children are at a greater risk of health effects from pesticide exposure than adults. Research suggests that children are less able to detoxify chemicals and that exposures sustained early in life, including prenatal exposures, appear more likely to lead to disease than similar exposures encountered later (Landigran, 1999). Children are also at greater risk than adults of exposure to pesticide residues on sprayed surfaces. Due to their play and hand-to-mouth activities, children are in closer and more frequent contact with the physical environment (e.g., interior of home, backyard) than adults.

For the five years studied, 44 of the cases with health effects associated with a pesticide (3 confirmed, 12 likely, and 29 possible) were exposed while working. Although exposure to aerial drift of agricultural pesticides accounted for 19 of the occupationally related cases, only 5 of these cases were agricultural workers. The remaining cases were performing non-agricultural work on or near a field that was being sprayed. The agricultural workers were all exposed via drift of a pesticide from a neighboring field.

The number of reported occupationally related cases, especially for agricultural workers, is likely an underestimate of the actual number of pesticide illness among workers. Louisiana Poison Control Center data indicate that during an eight-month period, October 1999 through May 2000, it received 13 occupationally related pesticide exposure calls. The data only include calls concerning exposure to pesticides from three chemical classes: organophosphates, carbamates, and pyrethroids (Louisiana Poison Control Center, 2000).

Pesticide exposure data indicate that occupations involving pesticides, such as mixers/loaders, applicators, and agricultural workers, are at risk of acute and ongoing pesticide exposure (U.S. EPA, 1998). In Louisiana, there are more than 36,000 hired farmworkers, and 13% of Louisiana's acreage is planted for crops (U.S. Department of Agriculture, 1998). Based on data from states with required reporting of pesticide poisonings, the U.S. Environmental Protection Agency estimates 250 to 500 physician-diagnosed cases per 100,000 agricultural workers, including pesticide handlers. If undiagnosed and unreported cases were included, the actual number of cases would be twice as high (U.S. EPA, 1998). In addition to exposing themselves to pesticides, agricultural workers and pesticide applicators may also unknowingly expose their families by carrying pesticides into the home on their bodies, clothes, and shoes.

Types of Pesticides

Pesticides are classified according to the type of pest they are designed to harm. Incidents classified as confirmed (11 incidents), likely (28 incidents), and possible (83 incidents), were most likely to involve insecticides (57%), followed by herbicides (34%). The most frequently occurring insecticides were methyl parathion, chlorpyrifos, malathion, and lambda cyhalothrin. The most frequently occurring herbicides were glyphosate; 2,4-D; molinate; atrazine; and dicamba.

Methyl parathion, chlorpyrifos, and malathion are all organophosphate insecticides. Exposure to organophosphates causes cholinesterase inhibition. Some of the most commonly reported early symptoms resulting from exposure to cholinesterase inhibiting insecticides are headache, nausea, dizziness, and excessive sweating. Serious organophosphate poisoning can cause diarrhea, muscle twitching, weakness, vomiting, seizures, loss of consciousness, and death. The primary cause of death from organophosphate poisoning is respiratory failure (U.S. EPA, March 1999).

Symptoms of organophosphate poisoning develop during or after exposure, within minutes to hours, depending on the route of exposure. Exposure by inhalation results in the fastest appearance of toxic symptoms followed by ingestion and skin contact. Repeated or prolonged exposure to organophosphates may result in the same effects as acute exposure. Workers repeatedly exposed to chlorpyrifos experienced impaired memory and concentration, disorientation, severe depression, irritability, confusion, headache, delayed reaction times, nightmares, sleepwalking, and drowsiness (Extension Toxicology Network, 1996). Chronic exposure to low levels of organophosphates that are insufficient to produce signs and symptoms of acute poisoning may produce an influenza-type illness characterized by weakness, anorexia, and malaise (Eskenazi, 1999). Children exposed to cholinesterase inhibitors often present with a different clinical picture than adults. Seizures and mental status changes including lethargy and coma are more common in children. Other common signs in children include muscle weakness, contraction of the pupils, and excessive salivation (U.S. EPA, March 1999).

Lambda cyhalothrin is a synthetic pyrethroid. Contact dermatitis and allergic respiratory reactions are the most common symptoms following exposure to synthetic pyrethroids. Severe exposure can affect the nervous system causing symptoms such as tingling or burning sensation, tremors, disrupted motor function, and seizures. Unlike organophosphates, pyrethroids are poorly absorbed through the skin. Organophosphates and pyrethrins/pyrethroids are the two classes of pesticides most often implicated in symptomatic illnesses resulting from unintentional exposure (U.S. EPA, March 1999).

The five most commonly occurring herbicides are from five different chemical classes. Glyphosate of the chemical class phosphonate is a widely used herbicide, both for agricultural and non-agricultural purposes. Acute exposure to glyphosate can cause significant eye irritation. Long-term exposure to glyphosate has not been shown to cause any serious health effects (Extension Toxicology Network, 1989).

The herbicide 2,4-D, of the chemical class chlorophenoxy, is considered to be highly toxic because it can cause serious eye and skin irritation. Prolonged breathing of 2,4-D has also been shown to cause coughing, burning, dizziness, and temporary loss of muscle coordination, and chronic exposure to 2,4-D has been associated with an increased risk of some cancers (Extension Toxicology Network, 1989).

Molinate, a thiocarbamate, is a mild cholinesterase inhibitor. Acute exposure to molinate can cause eye and skin irritation, nausea, diarrhea, abdominal pain, fever, weakness, and conjunctivitis. Long-term exposure to molinate can cause abdominal and gastrointestinal

disorders, fever, weakness, and conjunctivitis (Extension Toxicology Network, 1989).

Atrazine, a triazine, is one of the most widely used herbicides in the United States. Acute exposure to atrazine can irritate the eyes, skin, and mucous membranes and cause abdominal pain, diarrhea, and vomiting (Extension Toxicology Network, 1989). Recent animal studies suggest that long-term exposure to atrazine may cause uterine, prostrate, and breast cancer and may also disrupt reproductive development (FIFRA Scientific Advisory Panel, 2000).

Dicamba is of the chemical class benzoic. Symptoms of acute exposure to dicamba include loss of appetite, vomiting, muscle weakness, slowed heart rate, shortness of breath, central nervous system effects, incontinence, bluing of the skin and gums, and exhaustion following repeated muscle spasms. Inhalation of the herbicide can cause irritation to the nasal passages and lungs, and loss of voice. Dicamba can also cause skin irritation and severe eye damage. Long-term exposure to dicamba can result in the same symptoms as acute exposure (Extension Toxicology Network, 1989).

Investigations of HRPIRs also consider the potential health effects associated with exposure to inert ingredients used in the pesticide product. If the pesticide product is not identified, information about inerts contained in the product is not obtainable. For incidents with an identified product, inert information was obtained. Only inerts considered to be highly toxic are required to be listed on product labels and Material Safety Data Sheets. Of the listed inerts, the most commonly occurring inert was xylene, a potentially toxic compound.

Health effects associated with inhaling xylene vapors range from nausea, headache, vomiting and dizziness to severe irritation or burns of the respiratory system. Depending on the amount of exposure, health effects associated with the other identified inerts include irritation to the eyes, skin, and respiratory tract, nausea, headaches, vomiting, loss of consciousness and coordination, respiratory problems, and pulmonary edema (Vincoli, 1997).

Environmental samples reveal important information about an exposure incident, such as verification of an off-target drift and pesticide identification. Environmental samples were collected for about half of the reported incidents. The number of incidents without environmental samples collected is likely associated with the timeliness of the complaint. Because many of the pesticides involved in HPRIRs degrade quickly when applied outdoors, environmental samples are often not collected if the complaint is filed weeks or months after the exposure incident. In addition, visual evidence of pesticide damage, especially herbicide damage, is often used instead of environmental samples to corroborate pesticide use.

Circumstance of Exposure

Drift of a pesticide was responsible for the majority of incidents classified as confirmed (11 incidents), likely (28 incidents), or possible (83 incidents). Most drift incidents involved the use of a pesticide for agricultural purposes. Pesticides applied to agricultural crops are often licensed for restricted use due to their toxicity to humans, the environment, or both. In addition to causing serious acute health effects, on-going or repeated exposure to these pesticides can

cause chronic health effects. The large percentage of complainants exposed to agricultural pesticides in residential settings suggests that individuals who live, work, or attend school in close proximity to agricultural fields are at risk of ongoing exposure to pesticides drifting off-target.

The major variables involved in pesticide drift include droplet size, weather conditions, and buffer zones. Studies estimate drift following aerial applications can range from 330 to 5250 feet (Cox, 1995). Even under optimal weather conditions, pesticide drift can occur. Regardless of the factors causing drift, it is illegal for a pesticide to drift off-target. The Federal Insecticide, Fungicide, and Rodenticide Act (FIRFA) established minimum standards for pesticide regulation nationwide (7 U.S.C. §121 et seq.). Improper labeling, use, or application of pesticides violates FIFRA, and can result in civil and/or criminal penalties. In Louisiana, LDAF has been delegated the authority to prosecute FIFRA violations under the Louisiana Pesticide Law (Louisiana Revised Statutes 3:3208). In an effort to reduce drift in Louisiana, LDAF and the Louisiana State University Agricultural Center have taken aggressive steps to train pesticide applicators how to properly apply pesticides.

The crops treated with a pesticide resulting in off-target drift reflect the primary crops grown in Louisiana: cotton, sugar cane, rice, and soybean. These four crops account for 52 of the 64 incidents involving a pesticide that drifted off-target. Although soybeans and rice are grown on more acreage than cotton, cotton was involved in more off-target drift incidents than any other crop.

Health Effects

Forty-nine percent of the cases classified as confirmed (18 cases), likely (51 cases), or possible (162 cases) sought medical care: 27% had a clinic visit, and 22% went to the emergency room. The high percentage of cases that sought medical care following exposure suggests the importance individuals placed on the pesticide exposure and the onset and type of symptoms. Despite the large number of cases that sought medical care, most cases (70%) experienced temporary, mild symptoms, such as topical irritation or systemic symptoms that resolved shortly after the exposure incident.

To protect individuals from further inadvertent exposure to pesticides, many individuals who filed a HRPIR received information about Louisiana's Registry of Pesticide Hypersensitive Individuals. The annually updated registry is provided by LDAF to all licensed applicators and pest control operators. The applicators and operators are requested to voluntarily notify individuals on the registry prior to making an application within one hundred feet of their property. Because applicator notification is voluntary, inclusion in the registry does not guarantee that pesticide exposure will not occur, yet it can help to limit future exposures.

The majority of severe cases, including 1 fatality, were exposed to a restricted use pesticide in a household setting. Although rare, these cases indicate that some Louisiana residents have access to restricted use pesticides, and they are unaware of the health risks associated with using pesticides. Louisianans' access to restricted use pesticides and misuse of household pesticides has been previously noted in a LDHH survey on pesticide behavior use and

during Louisiana's Methyl Parathion Program. The Pesticide Behavior Survey indicated that 19% of surveyed respondents used pesticides labeled for outdoor use inside of their homes. Louisiana's Methyl Parathion Program, which was in effect from 1996 through 1999, identified hundreds of Louisiana residents who illegally sprayed their homes with methyl parathion as a means of cockroach control.

Conclusion

During the past year, several initiatives have been undertaken to expand the surveillance and outreach capabilities of the HRPIR program. EPA funding was received by LDAF to develop and distribute a pesticide-related educational pamphlet. The pamphlet, What You Need to Know about Pesticides and Your Health in Louisiana, was designed and developed by LDAF, LDHH, and the Louisiana Environmental Action Network. The pamphlet discusses health effects associated with commonly used pesticides, how pesticide exposure occurs, what to do if you are exposed to a pesticide, laws regulating the use and application of pesticides, and how to file a HRPIR. The pamphlet was distributed statewide through parish health units, state libraries, the Louisiana Extension Services, academic institutions, and non-governmental organizations working in the area of environmental health. The pamphlet is also available on agencies' websites.

To increase healthcare providers' understanding and knowledge of health effects associated with acute pesticide exposure, an educational outreach project is targeted for two agricultural regions of the state. Education on pesticide poisoning recognition, management, and reporting will occur through continuing education courses and grand rounds, publications in local medical journals and newsletters, and healthcare workshops. In addition to educating providers in the targeted areas, active surveillance will be also conducted to ensure that physician-diagnosed pesticide illnesses are reported and investigated.

Obtaining reliable and timely pesticide surveillance data would be particularly important in the event of a terrorist attack involving pesticides or organophosphate nerve agents. A report on biological and chemical terrorism by the Centers for Disease Control and Prevention states that "disease surveillance systems at state and local health agencies must be capable of detecting unusual patterns of disease or injury, including those caused by unusual or unknown threat agents" (CDC, 2000). Pesticide surveillance data can be used to identify a sentinel event that precedes a terrorist attack, providing an opportunity for prevention. Sentinel events that could be identified through surveillance include clusters of exposures occurring outside of a pesticide's normal use pattern, exposure to a highly toxic agent by individuals who would not normally have access to toxic pesticides, and multiple reports of individuals with similar health effects.

The importance of using surveillance data to identify a sentinel event that precedes a terrorist attack was illustrated by the events leading up to the 1995 cult attack on a Tokyo subway. The subway attack involved the release of sarin, an organophosphate nerve gas, causing the death of twelve people and poisoning more than 5,000 people. Prior to the attack, there were a number of incidents involving health effects associated with sarin exposure. At least three occasions involved leaks from a sarin manufacturing facility used by the cult that resulted in nearby residents experiencing eye and nose irritation and nausea (Blondell, 2001). If any of

these incidents had been properly reported and investigated, the subsequent terrorist attack on the Japanese subway might have been prevented.

Efforts to improve physician reporting of cases is critical. Currently, the Louisiana Pesticide Law requires physicians to report pesticide poisoning cases to LDAF. The LDHH could increase physician reporting through physician outreach and education and by amending the Louisiana Sanitary Code to include pesticide-related illness and injury on the list of reportable conditions. Physicians are more likely to report pesticide poisoning if it is a mandated by LDHH statute because of the medical nature of the condition and familiarity with reporting diseases/conditions to LDHH. In addition, LDHH works closely with healthcare providers and is well-suited to conduct follow-up education and outreach activities.

In conclusion, LDHH and LDAF's HRPIR Program reflects an interagency effort that is essential for surveillance of environmentally related health conditions like pesticide-related illness. The thorough environmental and health investigations conducted by LDHH and LDAF yield detailed data about reported pesticide exposures occurring in Louisiana. Analysis of five years of HRPIR data revealed several important findings: 1) drift of agricultural pesticides accounted for the largest percentage of incidents; 2) most health-related pesticide incidents occurred in a residential setting; 3) exposure to organophosphate insecticides accounted for the largest percentage of health-related pesticide incidents; and 4) the majority of severe cases were exposed to a restricted use pesticide in a residential setting.

Data also suggest that the complaint-based nature of the HRPIR Program does not capture the actual number of health-related pesticide incidents occurring in Louisiana. To enable us to better survey health effects associated with pesticide exposure, a pesticide pamphlet has been distributed statewide, and outreach and physician education and reporting activities have been proposed. These activities will likely increase the number of pesticide exposure complaints received and investigated by LDAF and LDHH. Improved surveillance data can be used to better estimate the extent of pesticide-related illness, identify populations at risk and emerging pesticide problems, including possible terrorist acts. Ultimately, the data will enable us to develop targeted intervention activities to prevent inadvertent exposure to pesticides.

VI. RECOMMENDATIONS

The following recommendations will be jointly pursued by the Louisiana Department of Health and Hospitals and the Louisiana Department of Agriculture and Forestry.

- Develop and assess the feasibility of implementing a plan to encourage physician reporting of illnesses associated with pesticide exposure. Outreach and educational efforts should target physicians practicing in Louisiana's agricultural areas.

- Develop and assess the feasibility of implementing a plan to give healthcare providers treatment and diagnostic information about pesticide exposure.

- Continue to evaluate factors contributing to pesticide misapplication in an effort to minimize off-target drift.

- Continue to educate residents and agricultural workers and their families about health effects associated with pesticide exposure and the Health-Related Pesticide Incident Report Program.

- Obtain pesticide exposure data from other sources (e.g., Poison Control Center, Hospital Emergency Departments, Workers' Compensation Office).

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VIII. APPENDICES

Appendix A: Contact Information

Louisiana Department of Agriculture and Forestry (LDAF)
Office of Agricultural & Environmental Sciences
Pesticide & Environmental Programs
P.O. Box 3596
Baton Rouge, LA 70821-3596
24-hour Pesticide Hotline: (225) 925-3763
Website: http://www.ldaf.state.la.us/

Contact LDAF to file a *Health-Related Pesticide Incident Complaint* or to obtain an application for the *Registry of Pesticide Hypersensitive Individuals*.

Louisiana Department of Health & Hospitals (LDHH)
Office of Public Health
Section of Environmental Epidemiology & Toxicology
325 Loyola Avenue, Suite 210
New Orleans, LA 70112
Toll-free Number: 1-888-293-7020
Website: http://oph.dhh.state.la.us/

Contact LDHH for information or questions regarding this report and to obtain copies of the Methyl Parathion Final Report, the Pesticide Behavior Survey (Methyl Parathion and Other Pesticides Public Health Education Project), and the Registry of Pesticide Hypersensitive Individuals Final Report.

The pamphlet, What You Need to Know about Pesticides and Your Health in Louisiana, can be obtained from LDHH or LDAF. The pamphlet is also available on LDHH's website.

Appendix B: Pesticide Pamphlet

What You Need to Know About Pesticides & Your Health in Louisiana

only be applied in select situations and only by certified applicators.

FIFRA establishes minimum standards for pesticide regulation nationwide. In Louisiana, the Department of Agriculture and Forestry (LDAF) regulates pesticide use through FIFRA and the Louisiana Pesticide Law. Louisiana can pass laws that are more stringent than FIFRA, but may not weaken its provisions. For example, Louisiana schools are required to develop an Integrated Pest Management plan and maintain records of pesticides used on school property. Schools are encouraged to use the least toxic method of pest control.

Improper labeling, use or application of pesticides violates FIFRA, and can result in civil and/or criminal penalties. State agencies have been delegated the authority to prosecute FIFRA violations. Private individuals can sue for damages to person or property.

The U.S. Environmental Protection Agency's ***Worker Protection Standard*** (WPS) protects the health of workers and pesticide handlers (mixers, loaders and applicators) involved in the production of agricultural and forestry products.

WPS requires agricultural employers to exclude workers from areas being treated with a pesticide and areas under a restricted-entry interval (REI). List of pesticide treatments made on a field and applicable REIs must be posted in a central location. REIs are found on the pesticide label.

WPS also requires agricultural employers to provide the following:

- pesticide safety training for all workers and pesticide handlers;
- personal protective equipment for pesticide handlers and early-entry workers;
- adequate supply of water, soap and towels for decontamination; and
- transportation to a medical facility when a worker or handler is injured.

Are there laws governing aerial application of pesticides?

LDAF regulates the spraying of pesticides from aircraft. The Federal Aviation Administration regulates the operation of aircraft during aerial applications. Complaints regarding the operation of aircraft may be directed to the Federal Aviation District Office: (225) 358-6800.

Whom may I contact about pesticide problems?

If you believe you have suffered health effects from a pesticide exposure, file a Health-Related Pesticide Incident Complaint as soon as possible with LDAF. Complaints are investigated by LDAF and the Department of Health and Hospitals (DHH). LDAF determines if a misapplication or violation has occurred, and DHH evaluates the health effects resulting from the pesticide exposure. A final report is provided to the complainant. To file a complaint, contact

LDAF's Pesticide Hotline: (225) 925-3763

If you believe a pesticide is being applied incorrectly, or wish to report violations of the Worker Protection Standard, contact LDAF.

Steps you can take after a Health-Related Pesticide Incident:

1. Call LDAF's Pesticide Hotline: (225) 925-3763.
2. Contact the applicator and/or property owner to inquire about the pesticides used and to inform them of the incident.
3. Save contaminated clothing in a plastic bag for sampling. Close the bag securely.
4. Take photographs and/or a videotape of the area that was sprayed.
5. Record contact information of any witnesses.
6. Keep a written record of the incident and subsequent events, including agency contact, onset and duration of symptoms, physician visits and medical tests.
7. Keep copies of all letters and records.

Are there organizations working on the issue of pesticides?

To learn about organizations working in your area on the issue of pesticides, contact the Louisiana Environmental Action Network (LEAN). LEAN is a non-profit organization dedicated to making Louisiana's communities safer, healthier places to live. Its goal is to foster cooperation and communication among individuals and organizations to address environmental problems in Louisiana.

Department of Agriculture and Forestry
Bob Odom, Commissioner
Office of Agricultural & Environmental Sciences
Pesticide & Environmental Programs
P.O. Box 3596
Baton Rouge, LA 70821-3596
24-hour Pesticide Hotline: (225) 925-3763
Website: www.ldaf.state.la.us/aes/index.htm

Department of Health and Hospitals
Office of Public Health
Section of Environmental Epidemiology
& Toxicology
325 Loyola Avenue, Suite 210
New Orleans, LA 70112
Toll-free Number: 1-888-293-7020
Website: www.dhh.state.la.us/OPH/

Louisiana Environmental Action Network (LEAN)
P.O. Box 66323
Baton Rouge, LA 70896-6323
Telephone Number: (225) 928-1315
Website: www.leanweb.org

Louisiana Poison Control Center
Toll-free Number: 1-800-256-9822
Website: www.lapcc.org

National Pesticide
Telecommunications Network (NPTN)
NPTN provides pesticide information to the public.
Toll-free Number: 1-800-858-7378
Website: ace.orst.edu/info/nptn

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What You Need To Know About Pesticides & Your Health in Louisiana

This pamphlet was created by the Louisiana Department of Agriculture & Forestry, the Louisiana Department of Health & Hospitals and the Louisiana Environmental Action Network.

WHAT EVERYONE SHOULD KNOW ABOUT PESTICIDES

What is a pesticide?

Pesticides are chemicals developed to repel, control or kill pests. Pests can be insects, weeds, fungi or rodents. There are more than 17,000 pesticide products used in the U.S.. Pesticides are widely used on agricultural crops, in the home, yard and public places. The types of pesticides commonly used are also called insecticides, herbicides, fungicides and rodenticides.

Are pesticides harmful to people?

In addition to harming pests, many pesticides can also harm people. The harmful effect of a pesticide depends on the strength or toxicity of the chemical ingredients, the amount and the length of time of the pesticide exposure and the way it enters the body. ***Reading the label and following directions can prevent many pesticide-related illnesses.***

Are some people at greater risk to the effects of pesticides?

People have different responses when exposed to pesticides. Depending on their basic health condition, age and individual characteristics, the responses of people can be very different. Small children, the elderly and people with health conditions may be affected more. How often and how long people come into contact with pesticides also affects their risk of developing problems from exposure.

How can I be exposed to pesticides?

Exposure occurs when you come into contact with a pesticide and it enters your body. A risk of exposure may be present if pesticides are nearby, but they must contact your body to harm you. There are three major ways for pesticides to enter the body. If a pesticide is in the air, it can be inhaled and may pass into the bloodstream. If it is in food or water, or if it is accidentally swallowed, it can enter through the stomach. Certain pesticides may pass through the skin. Some pesticides may irritate the skin, eyes, nose and throat if you come into direct contact with them.

Examples of Pesticide Exposure:

Drift or Overspray: Pesticide spray from an airplane, tractor or a home sprayer may drift or blow onto people living, working or going to school near agricultural fields or other application sites.

Occupational: Farmworkers, applicators or mixers may touch or inhale large amounts of pesticides. Workers may unknowingly expose their families by carrying pesticides into their homes on their bodies, clothes and shoes, or by not washing their work clothes separately from the family laundry.

Household: Improper use, storage and application of household pesticides such as insect repellents, foggers and baits, rodent poisons, weed killers, flea and tick control products and disinfectants (such as bleach) can lead to poisonings.

WHAT TYPES OF PESTICIDES ARE COMMONLY USED

Insecticides

Insecticides are used to control or kill insects. Organophosphate and carbamate insecticides are the most common type of insecticide used on crops and in the home. Most pesticide poisonings result from exposure to organophosphate insecticides. Organophosphate and carbamate insecticides affect the nervous system of people. Exposure to toxic amounts can cause adverse effects ranging from shortness of breath, excessive salivation, nausea, vomiting, headache, dizziness and chest discomfort to convulsions, paralysis and even death.

Examples of Organophosphates:

- *Chlorpyrifos (Dursban®, Empire®, Lorsban®)*
- *Diazinon (Basudin®, Knox Out®, Spectracide®)*
- *Malathion (Dielathion®, Fyfanon®, Malatox®)*
- *Methyl Parathion (Bladan M®, Penncap-M®)*

Examples of Carbamates:

- *Aldicarb (Temik®)*
- *Carbaryl (Sevin®)*

Two other types of insecticides are pyrethrins/ pyrethroids and organochlorines:

Pyrethrins/pyrethroids are not considered to be very toxic, although skin irritation and asthma have occurred following exposure.

Examples of Pyrethrins/Pyrethroids:

- *Cypermethrin (Ammo®, Cybush®)*
- *Lambda-cyhalothrin (Karate®)*
- *Permethrin (Ambush®, DeLice®, Dragnet®, Pounce®)*
- *Pyrethrin (CheckOut®)*

Organochlorine insecticides include DDT, chlordane, endosulfan and lindane. DDT and chlordane are no longer widely used because of their persistence in the environment and their toxicity to wildlife and humans. Organochlorines can accumulate in the body and remain for long periods of time. Short-term exposure can cause headache, vomiting, diarrhea, dizziness and seizures. Long-term exposure to some organochlorines has been shown to alter reproductive development in animals.

Examples of Organochlorines:

- *Endosulfan (Phaser®, Thiodan®)*
- *Lindane (Gammasan®, Kwell®)*

Herbicides

Herbicides are used to kill weeds. Exposure to toxic amounts of a herbicide can cause eye and skin irritation, coughing, burning of the throat and lungs, dizziness, nausea and temporary incoordination.

Examples of Herbicides:

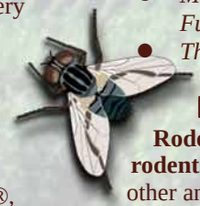
- *Atrazine (AAtrex®, Atranex®, Crisazina®)*
- *2,4-D (Barrage®, Lawn-Keep®, Plantgard®, Weedone®)*
- *Glyphosate (Polado®, Rodeo®, Roundup®)*
- *Molinate (Arrosolo®, Ordram®)*

Fungicides

Fungicides are used to control molds, fungi and mildew. They are widely used in agriculture, industry, and the home and garden for a number of purposes: protection of seed grain, berries, flowers and grasses; and control of mildews and slime. Different fungicides vary in their potential for causing harm. The most common health effect is irritation to the skin, mouth and nose. Some of the more toxic fungicides can cause headaches, nausea, vomiting, dizziness and loss of consciousness.

Examples of Fungicides:

- *Benomyl (Benlate®)*
- *Mancozeb (Green Light General Purpose Fungicide®, Dithane DF®)*
- *Thiophanate Methyl (Banrot®)*



Rodenticides

Rodenticides are used to kill rats, mice and other rodents. Exposure to toxic amounts of warfarin and other anticoagulant rodenticides can cause internal bleeding. Exposure to other rodenticides can cause difficulty breathing, nausea, vomiting and unconsciousness. Typically, it is necessary to consume rodenticides by mouth in order to be harmed.

Examples of Rodenticides:

- *Bromadiolone (Acilone®, Bromalone®)*
- *Warfarin (Dicusat E®, Ramorin 2®)*

WHAT SHOULD I DO IF I AM EXPOSED TO A PESTICIDE?

1. First Aid Treatment:

   Poison on Skin or Clothing -Remove clothes immediately and wash skin with running water for fifteen minutes.

   Poison in Eyes-Rinse eyes with water for fifteen minutes.

   Inhaled Poison-Leave the area and seek fresh air.

   Swallowed Poison-Read label to determine if there is something you should do right away.

2. Call the

   Louisiana Poison Control Center 1-800-256-9822

   The Center is staffed by trained professionals 24 hours a day. Center staff provide poison information and treatment recommendations related to pesticide exposure.

3. Seek medical help from your physician or hospital emergency room. Bring with you:
   - *labels of all pesticides to which you may have been exposed; and*
   - *records indicating what was sprayed from the person or company that sprayed.*

LAWS REGULATING THE USE AND APPLICATION OF PESTICIDES IN LOUISIANA

What laws regulate how pesticides are used?

The ***Federal Insecticide, Fungicide and Rodenticide Act*** (FIFRA) regulates the manufacture, sale and application of pesticides. FIFRA requires registration and labeling of all pesticides, for either general or restricted use. Restricted use pesticides can