Work-Related Exposures to Pesticides in Iowa, 2008-2012

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PESTICIDE POISONING SURVEILLANCE PROGRAM OVERVIEW

Iowa Administrative Code section 641-1.3(1) requires pesticide poisonings to be reported to the Iowa Department of Public Health (IDPH). Pesticides are defined under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) as "any substance or mixture of substances intended to prevent, destroy, repel or mitigate insects, rodents, nematodes, fungi, weeds, microorganisms, or any other form of life declared to be a pest by the Administrator of the U.S. Environmental Protection Agency (EPA) and any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant. Pesticides include herbicides, insecticides, rodenticides, fungicides, disinfectants, wood treatment products, growth regulators, insect repellents, etc."

Pesticide poisonings were added to the list of reportable diseases in *Iowa Administrative Code* section 641-1.3(1) due to concern about adverse human health effects from exposure to pesticides. The Pesticide Poisoning Surveillance Program within the Division of ADPER & EH monitors, collects, and analyzes pesticide poisonings to determine the extent to which Iowans are being affected by pesticide exposure. The information gathered by this program is disseminated to governmental agencies, the public, and health care professionals. In addition, IDPH is required to submit its findings annually to the Iowa Department of Agriculture and Land Stewardship (IDALS).

DATA SOURCE

From 2008 to 2012, IDPH received over 19,000 reports primarily from the Iowa Statewide Poison Control Center (ISPCC). The ISPCC receives calls and collects information from various sources then inputs the data into the TOXICALL® software database system. The ISPCC began reporting to IDPH through TOXICALL® in 2005. The Pesticide Surveillance Program downloads the occupational reports for evaluation and scoring to determine the case classification and the cases with 2 or more signs or symptoms are stored in the Iowa Pesticide Surveillance Database, SPIDER, for further data analysis and submission to NIOSH as part of the grant requirements. The SPIDER data is the source for this report.

PESTICIDE POISONING CASE CLASSIFICATION CRITERIA

In 2003, IDPH began using the National Institute of Occupational Safety and Health system for case classification. Reports received from the Iowa Statewide Poison Control Center are scored on three criteria to determine the case classification. The three criteria are:

A. Documentation of pesticide exposure.

B. Documentation of adverse health effects.

C. Evidence supporting a causal relationship between exposure and health effects.

The measurement scale is represented by numerical scores of 1 through 4, one being the highest level of information and four utilized for cases with insufficient data or information. The table on the following page outlines each of the three criteria and defines each of the four levels of measure for each. Table 1 on page 5 outlines how these criteria are utilized to determine the classification categories used for pesticide exposures.

Table 1 -- Case Definition for Acute Pesticide-Related Illness and Injury Cases

A.	**Documentation of Pesticide Exposure**
1.	Laboratory, clinical or environmental evidence is available to corroborate exposure to a pesticide. At least one of the following must be satisfied to receive a score of "1"
	Analytical results from foliage residue, clothing residue, air, soil, water, or biologic samples showing the presence of a pesticide.
	Observation of residue and/or contamination, including damage to plant material from herbicides, by a trained professional.
	Biologic evidence of exposure through response to administration of an antidote such as 2-PAM, Vitamin K1, or repeated doses of atropine.
	Documentation by a licensed health care professional of a characteristic eye injury or dermatologic effects at the site of direct exposure to a pesticide product known to produce such effects.
	Clinical description by a licensed health care professional of two or more post-exposure health effects, at least one of which is a sign, or an objective finding that can be observed and described by a licensed health care professional.
2.	Evidence of exposure based solely upon written or verbal report. At least one of the following must be satisfied to receive a score of "2":
	Report by case.
	Report by witness.
	Written records of application.
	Observation of residue and/or contamination, including damage to plant material from herbicides, by other than a trained professional.
	Other evidence suggesting that an exposure occurred.
3.	Strong evidence that no pesticide exposure occurred receive a score of "3".
4.	Insufficient data to receive a score of "4".
B.	**Documentation of Adverse Health Effect**
1.	Two or more new post-exposure abnormal signs (objective findings that are observed and described by a licensed health care professional) and/or test or laboratory findings reported.
2.	Two or more new post-exposure abnormal symptoms, which are subjective evidence of a disease or a condition as perceived and reported by the patient, were reported. When new post-exposure signs and test or laboratory findings are insufficient to satisfy a "1" score, they can be used in lieu of symptoms toward satisfying a "2" score.
3.	No new post-exposure abnormal signs, symptoms, or test/laboratory findings were reported.
4.	Insufficient data, which includes having only one new post-exposure abnormal sign, symptom, or test or laboratory finding.
C.	**Evidence Supporting a Causal Relationship between Pesticide Exposure and Health Effects**
1.	Where the findings documented under the Health Effects criteria are one of the following:
	Characteristic for the pesticide and the temporal relationship between exposure and health effects is plausible.
	Consistent with an exposure-health effect relationship based upon the known toxicology of the pesticide.
2.	Evidence of exposure-health effect relationship is not present.
3.	Definite evidence of a non-pesticide causal agent.
4.	Insufficient toxicological information is available to determine causal relationship.

Table 2 -- Classification Matrix

CLASSIFICATION CATEGORIES											
CLASSIFICATION CRITERIA	Definite Case	Probable Case		Possible Case	Suspicious Case	Unlikely Case	Insufficient Information		Not a Case		
									Asymptomatic	Unrelated	
A. Exposure	1	1	2	2	1 or 2	1 or 2	4	-	-	3	-
B. Health Effects	1	2	1	2	1 or 2	1 or 2	-	4	3	-	-
C. Causal Relationship	1	1	1	2	4	2	-	-	-	-	3

The matrix above provides the case classification categories and the criteria scores needed to place the case into a specific category. Each of the three criteria is listed with the corresponding scores of 1 through 4 to provide eight separate classification categories for pesticide exposures.

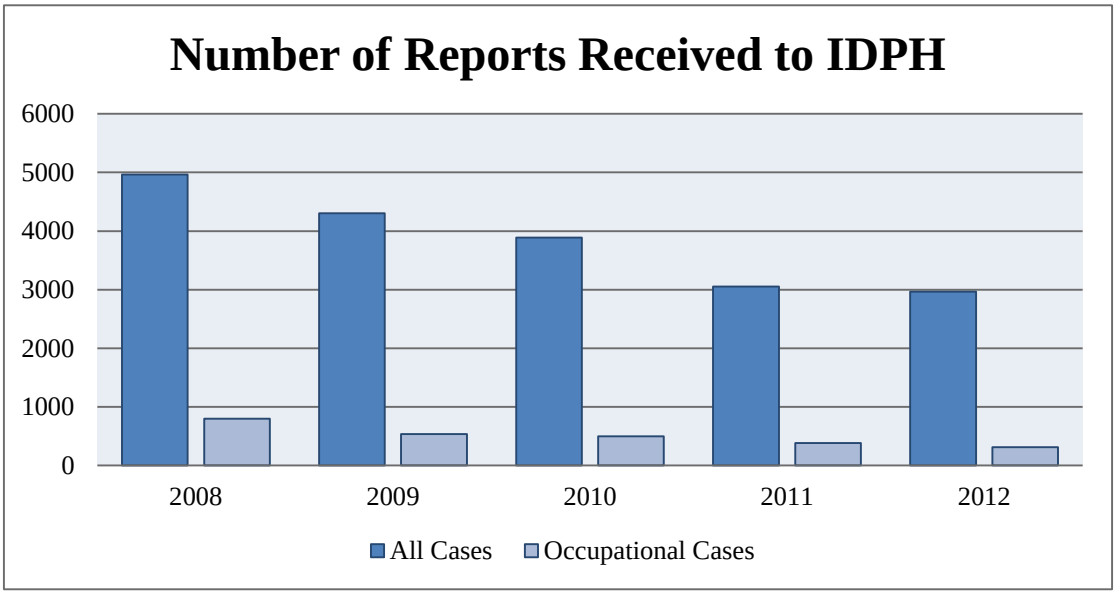
CASE COUNTS

During the period of 2008 to 2012 IDPH received a total of 19,171 reports from the Iowa Statewide Poison Control Center (ISPCC). Of these reports, 2,519 were exposures at the workplace (13%). Table 3 provides the yearly breakdown. The annual reduction in reports is not truly due to fewer calls from ISPCC, but rather from a continual refinement of the query procedures from the ISPCC to provide IDPH with the best data possible, without additional cases not needed. On average, the ISPCC receives over 50,000 calls per year. The IDPH dataset is just a fraction of the overall volume of the system.

Table 3 - Number of Reports per year

Year	All Reports	Occupational Reports
2008	4962	794.0
2009	4302	535.0
2010	3888	498.0
2011	3055	382.0
2012	2964	310.0
Total	**19171**	**2519**

Figure 1 – Number of Reports Received to IDPH



OCCUPATIONAL CASE DEMOGRAPHICS

Once IDPH receives the data from ISPCC, it is processed according to the methods and definition outlined by the National Institute of Occupational Safety and Health (NIOSH) system for case classification. Iowa collects, analyzes and submits annual pesticide data to the Sentinel Event Notification System for Occupational Risk (SENSOR) program of the Occupational Health and Safety Surveillance cooperative agreement as required as part of the Iowa award.

The classification categories determine the level of certainty of exposure, documentation of health effects and the likelihood of reported health effects based on known toxicology. The case classification categories are:

Definite: Objective evidence confirms the exposure and illness, and the related illness is consistent with known toxicology.

Probable: Objective evidence of either pesticide exposure or health effects, and the related illness is consistent with known toxicology.

Possible: Only subjective evidence of exposure and illness is available, and the related symptoms are consistent with known toxicology.

Suspicious: Insufficient toxicological information to determine a causal relationship between exposure and health effects.

Unlikely: The relationship between reported exposure and illness is not consistent with known toxicology.

Insufficient Information: Insufficient documentation on exposure or health effects.

Asymptomatic: Exposure reported, but no signs or symptoms.

Unrelated: Determination that health effects were due to other conditions, not pesticides.

CASE CLASSIFICATION

Only occupational cases that meet the NIOSH case definition and have a 1 or 2 in A, B and C of the Classification Matrix (see table 2) are included in the SPIDER database and used by the SENSOR program Therefore this report is limited to those cases. Table 4 shows the number of cases per year, the case classification and grand totals. As seen in Table 4, only 331 of the 2519 occupational cases (13%) meet the case definition to be included in SPIDER and in this report.

Iowa has averaged approximately 61 cases of occupational pesticide poisonings per year, except for 2011, which had a total of 88 cases. This increase is mostly unexplainable, as the cases were similar to previous years, but more frequent. One hypothesis is that the increase is due to the Occupational Health Program conducting outreach and education to providers on contacting ISPCC for all pesticide related exposures as a method of reporting pesticide cases to the state in 2011.

From 2008 to 2012, an average of 60% of occupational cases analyzed were classified as "definite" or included sufficient evidence of exposure, adverse health effects, and showed a causal relationship. The majority of the remaining cases (37%) were in the "possible" case status classification usually due to the person exposed not going to a medical facility for evaluation. The remaining 3% of cases were classified as probable or suspicious cases. Both are due to inadequate or incomplete reporting data with the suspicious cases typically a result of insufficient evidence supporting the causal relationship between the pesticide exposure and the health effect. This often occurs when a case has signs or symptoms that are not consistent with the documented reactions from a particular pesticide.

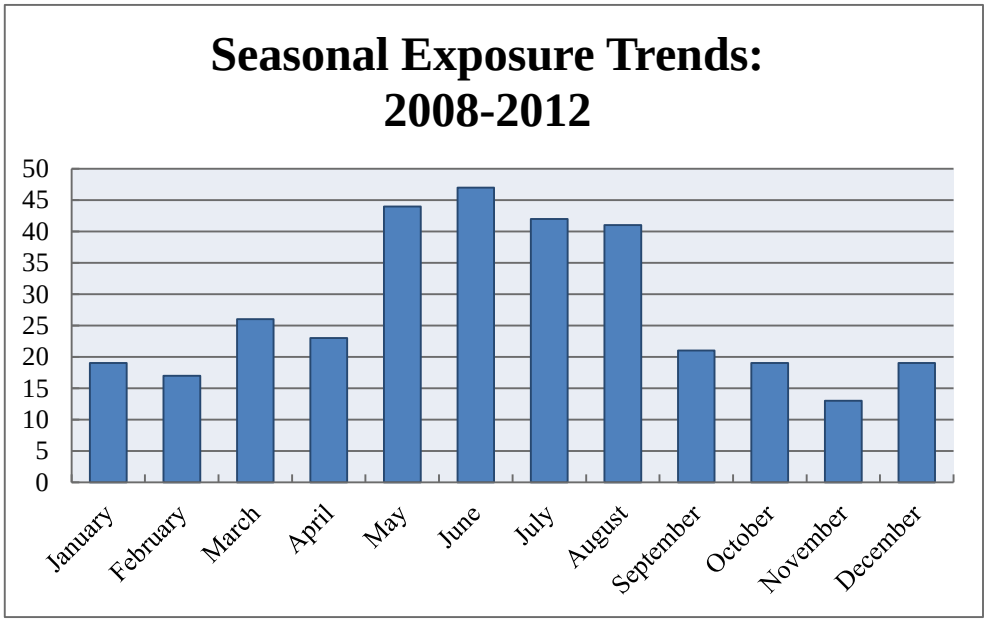
Table 4 – Case Classification by Year

Status	2008	2009	2010	2011	2012	Total
Definite Case	30	32	38	59	38	197
Probable Case	3	1	0	1	0	5
Possible Case	24	23	25	28	23	123
Suspicious Case	5	1	0	0	0	6
Grand Total	*62*	*57*	*63*	*88*	*61*	*331*

SEASONAL EXPOSURE

Figure 2 – Month of Pesticide Exposure

Pesticide use is often thought of as being a spring or summer activity. Figure 2 displays the number of cases and the month of the exposure. Around 53% of the cases happened in the four month period between May and August; however the other 47% happened throughout the remainder of the year.



This reinforces the knowledge that pesticide use and safety must always be followed and unintentional exposures happen year round.

Many pesticide exposures occur indoors account for the majority of the exposures. When outdoor exposures during the growing season are added, there is a large spike is seen during the warmer parts of the year.

AGE AND GENDER

A little over a third (36%) of reported exposures were in females with males making up an additional 63% (see table 5). This is consistent with previous reports showing historically that pesticide application is gender heavy towards males. However, a higher percentage of females are exposed to disinfectants or cleaning chemicals.

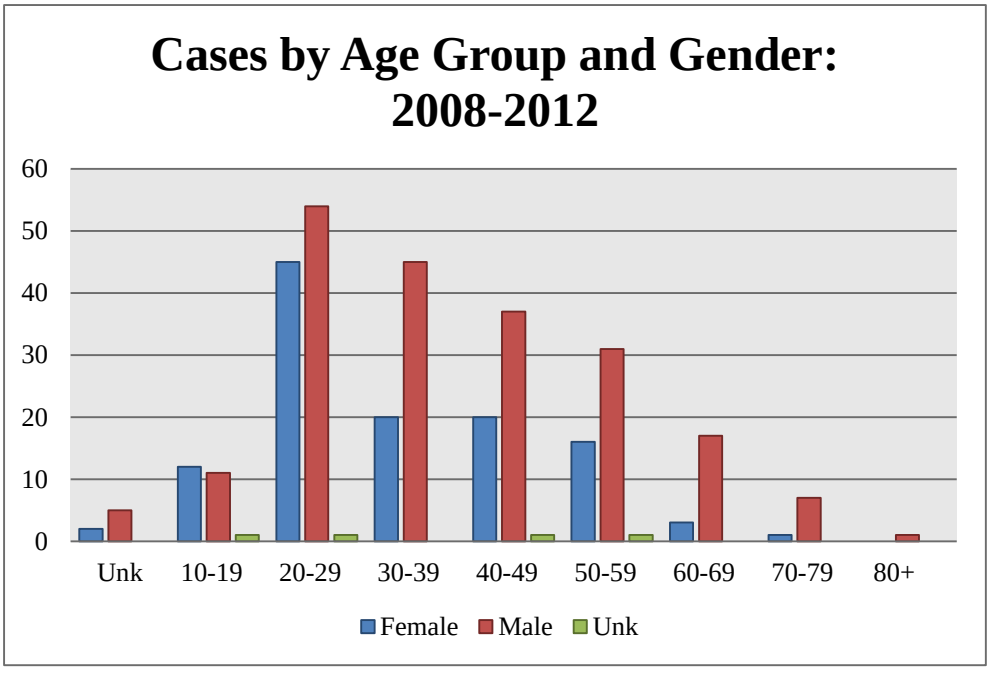
Table 5 – Cases by Age and Gender

Age Groups	Female	Male	Unk
Unk	2	5	0
10-19	12	11	1
20-29	45	54	1
30-39	20	45	0
40-49	20	37	1
50-59	16	31	1
60-69	3	17	0
70-79	1	7	0
80+	0	1	0
Total	**119**	**208**	**4**

Thirty percent of all reported workplace exposures occurred among the 20-29 year old age group (see table 5). The next age group of 30-39 had the next highest workplace exposure of 65 (20%) followed by 40-49 with 58 workplace exposures (18%).

Figure 3 – Cases by Age and Gender

Figure 3 is an additional visualization tool to review the age group and gender breakdown. As in table 5, a small number of cases are reported annually that do not have ages or gender, therefore the "Unk" category is used.



EXPOSURE CONDITIONS

Each pesticide exposure is described by the individual circumstances that contributed to the exposure. This may include the type of work being done when exposed, the manner in which the exposure happened, or other contributing factors surrounding each exposure.

PESTICIDE EXPOSURE CIRCUMSTANCES

Cases are classified based on the circumstances or manner in which the reported pesticide exposure transpired. Definitions of circumstances of exposure categories are:

Drift: Individual exposed to pesticide spray, mist or fumes carried from target site by air.

Targeted: Individual exposed to a pesticide released at the target site, and not carried away by air.

Spray: Individual exposed to direct spray.

Indoor air: Individual exposed by indoor air contamination.

Surface: Individual exposed by contact to a previously treated surface.

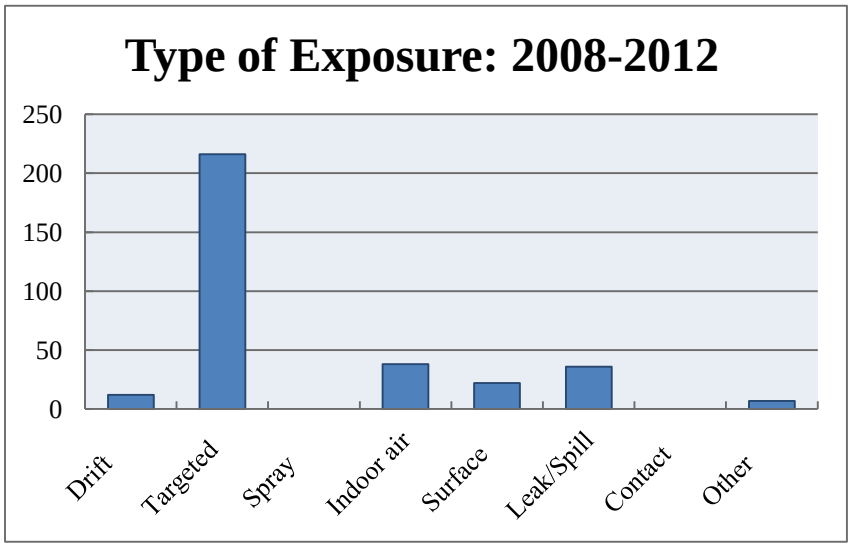
Leak or spill: Individual exposed to a lead or spill of pesticide

Contact: Individual exposed by direct contact during application to contaminated equipment or surface.

Other: Type of exposure not listed above.

Figure 4 – Exposure Classification

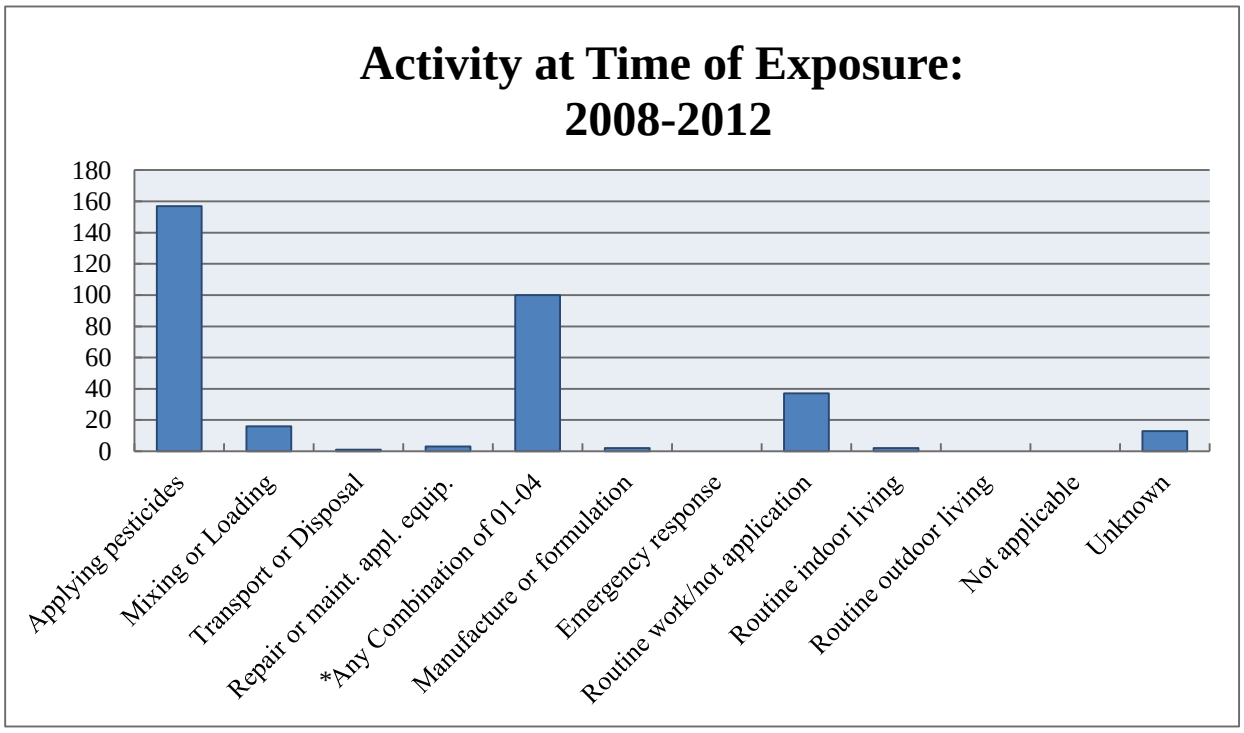
Targeted exposure classification accounted for 216 of the 331 exposures, or over 65% of the cases. This was followed by 11% for both indoor air and leaks or spills. 22 cases were exposed through surface exposure (7%). Drift and other classifications rounded out the remainder of the cases of exposure classifications as shown in Figure 4.



ACTIVITY DURING EXPOSURE

The Occupational Health and Safety Program also collected information on what the employee was doing at the time of the pesticide exposure. Figure 5 shows the activities occurring at the time of pesticide exposure. Almost half of the case reports list applying pesticides as the activity during exposure (47%) followed by 30% who identified "any combination of 1-4" (the first 4four categories in figure 5) which includes applying pesticides, mixing or loading pesticides, transporting or disposing of pesticides or repair and maintenance of application equipment. This category is used when the exact activity cannot be identified but it is known that at least 2 of the 4 activities were done during the exposure. The only other two activities of note are unknown and routine work not applying pesticides. The first group makes up only about 4% of the cases and the activity is unknown while the second makes up 11% of the cases. These 37 cases are of interest because they are often "bystanders" or people who do not know that a pesticide has been applied.

Figure 5 – Activities at Time of Exposure



*Any combination of 01-04 – Any action that includes applying pesticides, mixing or loading pesticides, transport or disposal of pesticides, or repair or maintenance of application equipment.

CONTRIBUTING FACTORS TO EXPOSURE

Along with the activities at the time of exposure, additional data are collected on other contributing factors surrounding the exposures. This may include factors such as lack of adequate personal protective equipment, failure to follow ventilation or re-entry guidelines or improper use and training of pesticides. The total number of contributing factors (383) is higher than the total number of cases (331) due to more than one contributing factor may be included in each case. An example of this would be if an employee knocks over a bucket of pool shock and the dust gets in the employee's eyes. This would be due to a spill of dust and eye protection not worn.

From 2008-2012, 109 cases had a contributing factor of improper or no eye protection. This accounted for 29% of the reported factors. When added to the 8% for not having gloves, 17% with inadequate or no respirator and 7% other personal protective equipment (PPE) not worn this comprises over 60% of the total number of contributing factors for exposure.

Table 6 – Contributing Factors to Pesticide Exposure

Factors	Exposures	Percent
Notification/posting lacking or ineffective	2	0.5%
People were in the treated area during application	10	2.6%
Structure inadequately ventilated before re-entry	3	0.8%
Early re-entry	3	0.8%
Required eye protection not worn or inadequate	109	28.5%
Required gloves not worn or inadequate	29	7.6%
Required respirator not worn or inadequate	64	16.7%
Other required PPE not worn or inadequate	26	6.8%
Spill/Splash of liquid or dust (not equip. failure)	48	12.5%
Application equipment failure	7	1.8%
Within reach of child or other improper storage	1	0.3%
Decontamination not adequate or timely	1	0.3%
Intentional harm	1	0.3%
Excessive application	2	0.5%
Label violations NOS	0	0.0%
No label violation identified but person still exposed	8	2.1%
Drift contributory factors	1	0.3%
Applicator not properly trained or supervised	2	0.5%
Illegal pesticide used / Illegal dumping	1	0.3%
Mixing incompatible products	40	10.4%
Other (Consider new code)	5	1.3%
Not applicable	0	0.0%
Unknown (Default value, Uncoded)	20	5.2%
Total	**383**	**100.0%**

Other factors to note are 13% from spill or splash of liquids or dust, and 10% from mixing incompatible products. This is most often the result of bleach and other non-compatible cleaning products mixed together to produce toxic chloramine gas and potentially explosive hydrazine. This is the most common cause of disinfectant exposures. Table 6 summarizes the contributing factors identified above.

PESTICIDE INFORMATION

Most pesticides contain one type of substance or mixture of substances intended to prevent, destroy, repel or mitigate insects, rodents, nematodes, fungi, weeds, microorganisms, or any other form of life. Each pesticide is grouped into a certain class based on its primary use, active ingredient, or target organism.

Iowa Code § 139A.3(2)c and 641 IAC 1.17(2) states that the identity of a business named in a report or investigation is confidential and shall not be accessible to the public. Therefore this report does not link a product or company name with any pesticide exposure. Table 7 shows the main classification of pesticides and included are examples of products that are in each of the classes. It should be noted that even if a product is listed below, IDPH does not imply that these specific products have been implicated in any reported pesticide exposure within this report.

Table 7: Main Classes of Pesticides and Product Examples

Class of Pesticide	Product Examples
Insecticide	Cobalt, Lorsban, Phantom, Poncho, Tempo, Terro Home/garden insect control products such as: Black Flag, Combat, Hot Shot, Ortho, Raid, Sevin
Herbicide\Algicide	Atrazine, Barren, Round-up, 2,4-D Crossbow, Harness, Algae-X, Baquacil
Fungicide	Quilt, Headline, Stratego, Bravo, Kocide, Compass
Fumigant	Tri-Brom, Oxyfume, Vaporph Phosfume
Rodenticide	Contrac, D-Con, Victor, Tomcat, Havoc, Enforcer
Disinfectant	Bleach, Pool & Spa Chemicals, Micorban, Enforce Bathroom/kitchen/toilet cleaners such as: Clorox, Formula 409, Lysol, Works, Proforce
Insect Repellant	Hartz, K9, Advantix, Off!, Moth Balls, Sergeants

PESTICIDE CLASS AND DESCRIPTION

Table 8 lists the classes of pesticides and the active ingredients that have most frequently been reported to the Iowa Statewide Poison Control Center and meets the case requirements of the NIOSH SENSOR pesticides program. These are manufactured by multiple companies and therefore do not violate the confidentiality of reporting.

Each case may involve multiple products. This has been captured below by including multiple class groups of common combinations of pesticide groups.

Disinfectants make up over 60% of the cases reported (201) followed by insecticides at 19% (62) and herbicides/algicides at 10% (34). Fungicides were only 5% of the reports (19) but are unique in that many of these reports are due to crop duster crashes and over spraying. The remaining three groups, fumigants, repellants and rodenticides only had a total of 6 cases while the outstanding 10 cases were from multiple chemical exposures that crossed classes.

Table 8: Pesticide Class and Number of Reports

Class of Pesticide	Chemicals Reported Frequently	Number of Reports
Insecticide	Chlorpyrifos, Cypermethrin, Cyhalothrin Pyrethrin, Cyfluthrin, Chlorfenapyr	62
Herbicide\Algicide	(2, 4-D), Atrazine, Glyphosate, Copper Sulphate Acetic Acid, Acetochlor, Glufosinate, Picoram	34
Fungicide	Azoxystrobin, Pyraclostrobin, Propionic Acid	19
Fumigant	Methyl Bromide	3
Rodenticide	Bromadiolone, Hydroxycoumarin	2
Disinfectant	Sodium Hypochlorite, Quaternary Ammonium, Citric Acid Sodium chlorocyanurate, Chlorophenol	201
Insect Repellant	DEET	1
Insecticide & Fungicide	Fludioxonil & Thiamethoxam	4
Insecticide & Other	D-Limonene, phosphorothioate, Pyrdone & Pyrethrins	4
Herbicide and Fungicide	Fomesafen Sodium & Proactin	2
Grand Total		331

PESTICIDE CLASS AND SEVERITY

The severity of pesticide exposure or illness is determined for each case. Severity is dependent on the signs and symptoms, the healthcare utilization, length of medical care, and lost time from work or normal activities. IDPH uses the NIOSH pesticide exposure case definition severity scale to determine the severity level. Severity is not calculated for cases classified as unlikely, insufficient information, asymptomatic or unrelated. Definitions of the severity categories are:

Fatal: Pesticide exposure resulted in death.

High: Symptoms due to exposure were life-threatening and medical treatment commonly involving hospitalization was required. Absence from work usually lasted more than 5 days.

Moderate: Symptoms due to exposure were less severe than life-threatening, but treatment was required.

Low: Exposure caused some health reactions to the skin, eye, or respiratory tract. Typically the illness resolved without medical treatment.

Table 9 lists the pesticide class and the severity of the cases that were a result of those chemicals. The majority of pesticide exposures was from disinfectants and was of low severity. Low severity accounted for 82% of cases; however 16% of cases were of moderate level. Three high and one fatality have occurred from pesticide exposures. The fatality was part of a crop duster crash while of the final three high cases were from an insecticide being sprayed in the face due to a hose breakage during application, and two were improper use of disinfectants.

Table 9: Pesticide Class and Severity

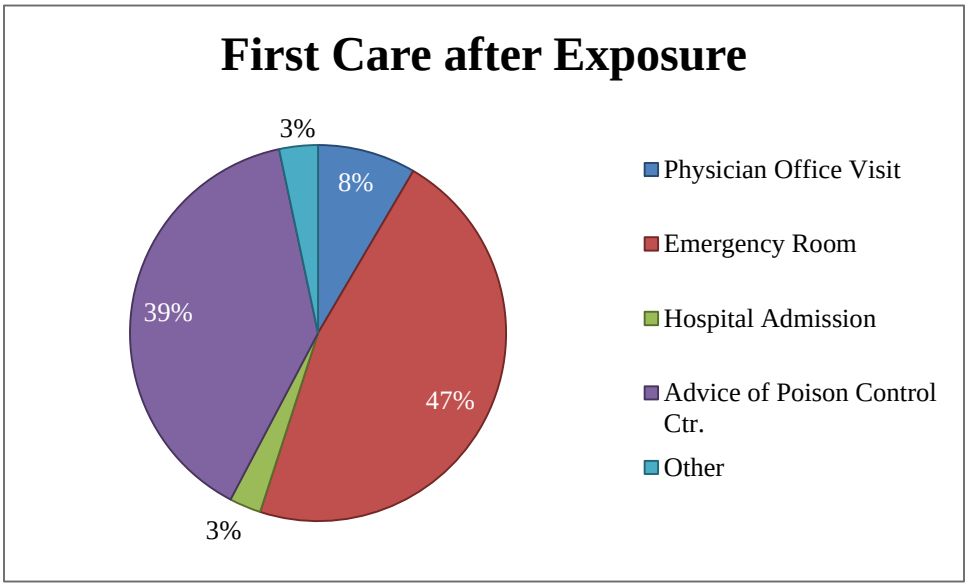
Pesticide Class	Fatal	High	Moderate	Low	Total
Insecticide	0	1	12	49	62
Herbicide	0	0	5	29	34
Fungicide	1	0	1	17	19
Fumigant	0	0	0	3	3
Rodenticide	0	0	0	1	2
Disinfectant/Broad Spectrum for Water Sanitation	0	2	33	166	201
Insect Repellent	0	0	0	1	1
Insecticide & Fungicide	0	0	1	3	4
Insecticide & Other	0	0	1	3	4
Herbicide & Fungicide	0	0	1	1	2
Total	**1**	**3**	**54**	**273**	**331**

MEDICAL INFORMATION

Previous sections of this report highlighted the demographic and chemical information related to pesticide exposures. This section will provide additional insight into the medical information beginning with what care was first sought to the signs and symptoms reported.

FIRST CARE

Figure 6 – First Care after Exposure



Almost half (47%) of the cases of pesticide exposure reported that they went to the emergency room for care as seen in figure 6. This percent could be biased towards seeking medical care due to the case definition requiring at least two signs or symptoms before being included. 39% of cases only spoke to poison control nurses for medical information without any further immediate medical care. 3% of the cases were admitted to the hospital or went to a private physician's office. 8% of cases were classified into the other category. This category includes employee health clinics and care by an ambulance service without going to the emergency room.

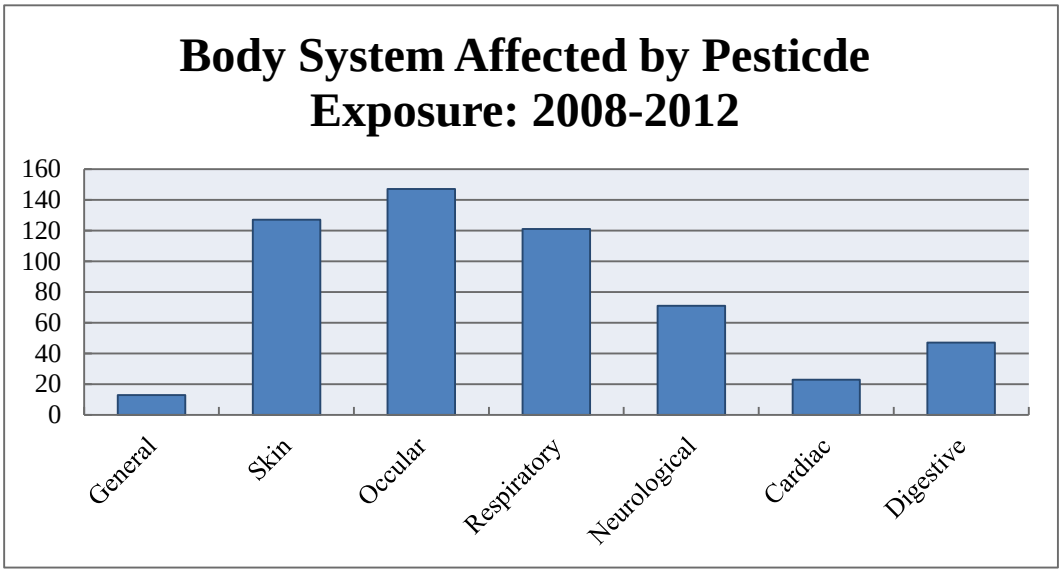
BODY SYSTEM AFFECTED

Often when a person is exposed to a pesticide, they will develop various signs or symptoms on one of the major body systems. Because each person can have multiple signs or symptoms and may affect different body systems, the total number is much higher than the 331 cases within this report. Figure 7 displays that the body system that had the largest number of reports was

ocular with over 26%. This is followed closely with the skin and respiratory systems which had 22% and 23% respectively.

Figure 7 – Body System Affected by Pesticide Exposure

The next highest value was neurological issues (13%) and then signs and symptoms of the digestive track (9%). The remaining 7 percent of signs and symptoms are found in the general and cardiac categories.



SIGNS AND SYMPTOMS

Below is a table that includes the most common signs and symptoms reported within each body system.

Table 10 – Signs and Symptoms

Body System	Most Common Sign or Symptom	Number of Reports
General	Fatigue, Fever	13
Skin	Burn, Edema, Redness, Rash, Pain	127
Ocular	Abrasion, Tears, Pain, Burn, Conjunctivitis	147
Respiratory	Cough, Dyspnea, Pain, Upper and Lower Airway Irritation	121
Neurological	Headache, Dizzy, Paresthesia	71
Cardiac	Chest Pain	23
Digestive	Nausea, Vomiting	47

SUMMARY

The Pesticide Poisoning Surveillance Program is an expanded programming component of the IDPH Occupational Health and Safety Surveillance Program (OHSSP) and supported by Cooperative Agreement Number 5U60OH008460-08 from the Centers for Disease Control and Prevention (CDC) National Institute for Occupational Health and Safety (NIOSH). The contents of this report are solely the responsibility of the authors and do not necessarily represent the official views of CDC-NIOSH.

The Iowa Department of Public Health (IDPH) receives an average of 3800 reports annually from the Iowa Statewide Poison Control Center (ISPCC). Of these reports around 500 are occupational in nature. Over the past 5 years, Iowa had 331 reports that met the Sentinel Event Notification System for Occupational Risk (SENSOR) case definition for pesticide poisoning that must be reported to the National Institute for Occupational Safety and Health (NIOSH). This averages to approximately 66 cases per year.

Over half of all pesticide exposures reported to IDPH happened in the months of May through August. Male was the most common gender reported (63%) and age groups of 20-29 and 30-39 made up around half of the exposures.

Of all exposures, 65% were “targeted” which is the exposure to a pesticide that was released at the target site and not carried away by air. Applying, mixing, transporting and disposing of pesticides were the most common activity during the exposure. 60% of exposures had a contributing factor of not wearing the appropriate personal protective equipment. Almost half (47%) of the cases went to the emergency room for evaluation and another 39% only used poison control advice as medical treatment.

Disinfectants made up over 60% of the cases of pesticide exposure reported to IDPH. An exposure that caused some type of health reaction to the skin, eye or respiratory track but resolved without medical treatment made up 82% of the cases. 26% of reports had signs or symptoms of the eyes, followed by 22% for the skin and 23% for the respiratory system.

LINKS

SPIDER software information and standardized variables:
http://www.cdc.gov/niosh/topics/pesticides/spiderdb.html

SENSOR pesticides case definition, severity index and standardized variables:

http://www.cdc.gov/niosh/topics/pesticides/case.html

For more information please visit: http://www.idph.state.ia.us/LPP/Pesticide.aspx or call 1-800-972-2026