Pesticide UPDATE

Summary of findings from the NC Pesticide Incident Surveillance Program, 2007 - 2009

Occupational and Environmental Epidemiology Branch. North Carolina Division of Public Health

More information about pesticide-related illness and injury surveillance is located at*:* *http://epi.publichealth.nc.gov/pests.html*

Background

Pesticides are used widely in agriculture and in many other settings to include homes, gardens, businesses, schools, parks, and public road and rail systems. These chemicals are designed to be toxic to certain life forms but can adversely affect non-target species such as humans. North Carolina is ranked first or second nationally for production of nine agricultural commodities (NASS, 2011) and there are many people working on farms here including migrant farm workers and their families (USDA, 2009). In order to monitor the extent and severity of health effects related to pesticide use in North Carolina the Occupational and Environmental Epidemiology Branch implemented a pesticide-related illness and injury surveillance system in 2007. The system is designed to determine the frequency of pesticide-related illness and injury; the distribution across occupations and the general population; the risk factors for exposure; and, actions necessary for risk reduction. This report summarizes surveillance findings for the period of 2007 – 2009.

Methods

The primary case ascertainment source for acute pesticide-related illness reports is Carolinas Poison Center (CPC). Access to reports is supported by a mandatory reporting law which allows health providers to report pesticide poisoning cases directly to CPC (NC 10A NCAC 41F .0101 - .0103). After reports are received by the program, cases are evaluated and classified. Reports are classified as “confirmed “when evidence supporting a causal relationship between exposure and health effects is strong. A severity score is also applied. Severity is based on signs and symptoms, whether medical care was sought, whether the affected individual was hospitalized, and whether lost time from work or usual activities occurred. North Carolina uses a standardized case definition, classification scheme, and severity index developed by the National Institute of Occupational Safety and Health, SENSOR Pesticides Program, Center for Disease Control and Prevention (CDC, 2005a). All tables and figures referenced in subsequent sections can be found in the Appendix.

Results

There were 2,480 reports of acute pesticide-related illness or injury received during 2007- 2009 with 80 cases identified as intentional poisonings (3.2%). Occupational

exposure accounted for 210 (8.5%) of reported cases and non-occupational exposure accounted for 2270 (91.5%) of reported cases. Among the 2,480 total reports, 2,316 separate poisoning events were identified since several reports consisted of multiple cases. A seasonal trend during 2007 – 2009 was observed with increasing cases during summer months (Figure 1).

Confirmed occupational cases:

- There were 122 confirmed cases resulting from occupational exposure and most were of low severity. Low severity indicates that symptoms were mild and typically resolved without treatment or lost time from work or normal activities.
- For confirmed cases were where race and ethnicity information were available individuals were mostly white (79%), and 22 percent of cases were Hispanic.
- Most cases were between age 20 - 29 (42%).
- The Agriculture, Forestry , Fishing and Hunting sector accounted for most of the confirmed cases (35%) followed by the Administrative, Support, Waste Management, and Remediation Services sector (eg. landscaping, pest control and waste management services) (25%) (Table 1).
- Farm laborers accounted for the largest percentage of workers within farming occupations (68%).
- Most of exposed occupational cases were applying pesticides when exposed (53%) and the most common type of exposure was “targeted exposure” when the pesticide was released at the application site from events like wind blow-back, ricochet, direct projection and entering an area currently being treated (50%) (Table 2).
- The primary route of exposure was dermal (39%).
- Insecticide products accounted for most of the exposures (56%) and the type of insecticide most often involved was pyrethroids as shown in Table 3.

Confirmed non-occupational cases:

- There were 1,002 confirmed cases resulting from non-occupational exposure and most were of low severity.
- The two deaths for the report period resulted from non-occupational exposure; one involved a suicide and the other a seven-year-old boy that accidentally ingested a restricted use pesticide illegally obtained by a sibling and stored in a Doctor Pepper bottle.
- Limited race and ethnicity data was collected for this group; when known, most confirmed cases where white (74%).
- Most cases were between age 40 – 49 (17%); almost one in five individuals were children, age nine and below.
- Most exposures occurred at a residence (97%).
- Most cases were applying pesticides when exposed (41%) and the most common type of exposure was “targeted exposure” when the pesticide was released at the application site from events like wind blow-back, ricochet, direct projection and entering an area currently being treated (60%) (Table 4).

- Most incidents occurred while treating a building structure, surface or space (eg. walls, structural members, perimeter areas, cracks and crevices, HVAC systems carpets, other interior area surfaces other than cracks and crevices) (39%) (Table 5).
- Manual placement (25%) and pressurized cans (25%) were the equipment types most frequently used during application. Examples of products that were manually placed include: lice medicine, mothballs, pet treatments, pool products, insect and rodent baits and, insect dust and powders.
- The primary route of exposure was inhalation (38%).
- Insecticide products accounted for most of the non-occupational exposures and the type of insecticide most often involved was pyrethroids as shown in Table 6.

Conclusions

Surveillance findings tracked for 2007 – 2009 suggest that most pesticide exposures occur at home during the summer months. The high number of incidents occurring at home are consistent with findings of other state surveillance programs (MI, 2009 and OR 2010), and reported use and incident patterns. Pesticide usage data (U.S. EPA, 2011) indicates that almost three fourths of American households use pesticides. National poison control data indicate that pesticides rank as # 10 among substance categories most frequently involved in human exposures reported to poison control centers and residential poisonings account for 93.8 percent of all reported exposures (worksites comprise 1.5 %). (Bronstein et al, 2010). Overall severity was low in for non-occupational cases. While the majority of the cases for this group ranged from age 20 to 60, it is concerning that we have documented that children are frequently exposed to pesticides and accidents involving them can have very serious health outcomes. Most non-occupational cases were applying pesticides when exposed. Certain types of chemicals are more commonly involved in non-occupational cases and affected individuals usually inhale the pesticides when accidents occur. Data show that insecticides are the class of products most often implicated in pesticide poisonings in the U.S. (Blondell, 2007). Pyrethroids have replaced more toxic pesticides for outdoor and indoor pesticide use over time (www.epa.gov). CDC data show that pyrethroid exposure is occurring in much of the U.S. population (CDC, 2005b).

Pesticide-related illness and injury is low at work in North Carolina Many young adults are becoming ill as a result of pesticide exposure in this setting. Like non-occupational cases most workers are affected during the summer months. Data reviewed suggest most work-related exposure occurs in agriculture, when applying pesticides, and the primary exposure route is dermal exposure. Pyrethroid insecticides are again the products most responsible for exposures. Analysis of multi-state surveillance data by NIOSH shows some trends similar to North Carolina. Their analysis indicated agriculture had the largest proportion of work-related pesticide poisoning cases and events occurred mostly during the summer months. Severity was low and insecticides were most responsible for exposures (Calvert et al., 2003). Workers who apply, mix or load pesticides are at highest risk of exposure due to the close contact with products, the quantities handled and the concentrations especially if mixing (Ladou, 2004). Dermal exposure is the most frequent type of occupational pesticide exposure (Donham and

Thelin, 2006). Farm laborers and those that work in landscaping and pest control are high risk occupational groups in North Carolina.

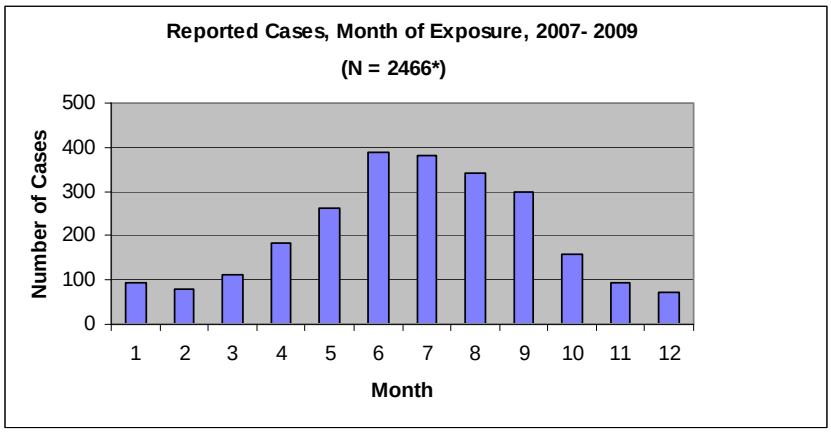
These data will help the program establish priorities for developing targeting prevention interventions. Focus should be placed on wise use of products at home especially during the summer and if children are present. Those that apply pesticides, and work on the farm and in landscaping or pest extermination are groups that may need additional training or awareness. The program will strive to obtain more detailed circumstancial data to help pinpoint relevant risk reduction efforts.

Limitations

This report is subject to at least two limitations. There is an under count of non-occupational cases. During the last three months of the reporting period, these cases were not entered into the database due to absence of staff. The pesticide poisoning case reports that were documented are minimum estimates due to the high likelihood for under-reporting. Under-reporting is considered likely due to the difficulties in clinical identification of pesticide poisoning, typically mild illness not requiring medical evaluation, and poor knowledge of reporting requirements (CDC, 2005a; IOM, 1993; EPA, 1999).

Appendix

Figure 1



* Month of exposure was unknown for 14 cases

Table 1

Industry of Confirmed Occupational Cases, 2007- 2009 (N=114*)

Type of Industy	Number	Percent
Agriculture, Forestry, Fishing & Hunting	40	35.1
Administrative, Support, Waste Management, Remediation Services	29	25.1
Retail Trade, Professional and Related Services	8	7.0
Accommodation and Food Services	6	5.3
Construction	5	4.4
Health Care and Social Assistance	5	4.4
Professional and Related Services	4	3.5
Arts, Entertainment, and Recreation	3	2.6
Manufacturing	3	2.6
Other Services (except Public Administration)	3	2.6
Public Administration	2	1.7
Real Estate Rental & Leasing	2	1.7
Mining	1	1.0
Transportation and Warehousing	1	1.0
Educational Services	1	1.0
Utilities	1	1.0
Total	114	100

* Industry was unknown for 8 confirmed cases

Categorized based on US Bureau of Labor Statistics, 2002 North American Industry Classification System (NAICS)

Table 2

Type of Exposure of Confirmed Occupational Cases, 2007 - 2009 (N=115*)		
Type	**Number**	**Percent**
Targeted	57	49.6
Leak Spill	25	21.7
Other	14	12.2
Surface	10	8.7
Indoor air	8	6.9
Drift	1	0.9
Total	115	100

* Type of exposure was unknown for 10 confirmed cases; three cases had two types of exposure

Table 3

Insecticide Chemical Classes Associated with Confirmed Occupational Cases, 2007 - 2009		
Insecticide Chemical Class	**Number**	**Percent**
01-Insecticid 05-Pyrethroids	43	44.8
01-Insecticid 96-Other **	16	16.7
01-Insecticid 02-Organophosphorus compounds	15	15.6
01-Insecticid 04-Pyrethrins	8	8.3
01-Insecticid 03-N-methyl carbamates	5	5.2
01-Insecticid 01-Organochlorine compounds	5	5.2
01-Insecticid 11-Inorganic compounds	2	2.1
01-Insecticid 10-Organo-metallic compounds	1	1.0
01-Insecticid 99-Unknown	1	1.0
Total	96*	100.0

* Some insecticide products contain more than one active ingredient.

** "Other" insecticides consisted of chemical classes to include synergists, mostly pipernyl butoxide (73%), neonicotinoids (16%), phenylpyrazols (5%), acaricides (5%).

Table 4

Type of Exposure of Confirmed Non-occupational Cases, 2007 - 2009 (N=991*)		
Type	**Number**	**Percent**
Targeted	592	59.8
Other	188	19.0
Surface	94	9.5
Leak Spill	54	5.4
Indoor Air	44	4.4
Drift	18	1.8
Total	990	100.0

* Type of exposure was unknown for 19 confirmed cases; seven cases had two types of exposure

Table 5

Target of Pesticide Application Confirmed Non-occupational Cases, 2007 - 2009 (N=913*)		
Target	**Number**	**Percent**
Building structure, surface or space treatment	341	37.3
Other	191	21.0
Treatment for human hair, clothing, skin	127	13.9
Veterinary; domestic animal and livestock	77	8.4
Undesired plant	55	6.0
Crops (vegetable, fruit, grain, oil)	33	3.6
Landscape/ornamental (lawns, flower gardens, ornamentals)	32	3.5
Non applicable	31	3.4
Bait for rodent, bird or preditor	24	2.6
Aquatic excluding pools (ponds, streams, lakes, canals)	1	0.1
Soil fumigation	1	0.1
Total	913	100.0

* Target of exposure was unknown for 89 confirmed cases.

Table 6

Insecticide Chemical Classes Associated with Confirmed Non-occupational Cases, 2007 - 2009		
Insecticide Chemical Class	**Number**	**Percent**
01-Insecticid 05-Pyrethroids	396	46.5
01-Insecticid 96-Other**	194	22.8
01-Insecticid 04-Pyrethrins	93	10.9
01-Insecticid 02-Organophosphorus compounds	75	8.8
01-Insecticid 03-N-methyl carbamates	64	7.5
01-Insecticid 11-Inorganic compounds	22	2.6
01-Insecticid 01-Organochlorine compounds	4	0.5
01-Insecticid 13-Indandione	1	0.1
01-Insecticid 15-Microbial	1	0.1
01-Insecticid 99-Unknown	1	0.1
Total	851*	100.0

* Some insecticide products contain more than one active ingredient.

** "Other" insecticides consisted of chemical classes to include synergists, mostly pipernyl butoxide (55%), aliphatic petroleum hydrocarbons (7%), phenylpyrazols (6%), neonicotinoids (6%), insect growth regulators (6%), and other miscellaneous classes (20%).

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