

Closeout

Project Title:
Grant Number:
Project Period:

Final Progress Report

Sentinel Event Notification System of Occupational Risk
1 U60 OH008341-01
09/30/2004 - 09/29/2005

Principle Investigator:

Robert R. Stone, PhD
rrs03@health.state.ny.us

New York State Department of Health
Bureau of Occupational Health
Flanigan Square - Room 230
547 River Street
Troy, NY 12180

Table of Contents

Abstract.....	7
General Goals of the Grant.....	7
Summary of Specific Activities Related to the Grant Goals.....	9
Highlights / Significant Findings.....	11
Evaluation of Reporting Sources.....	11
Evaluation of Health Care Provider Outreach.....	12
Translation of Findings.....	13
Outcomes / Relevance / Impact.....	14
Nature of 'Spurious' Data.....	14
Nature of SPIDER data.....	15
Overall efficacy of PPR Data Sources.....	18
Specific Activities - 1999.....	20
Specific Activities - 2000.....	20
Specific Activities - 2001.....	22
Specific Activities - 2002.....	25
Specific Activities - 2003.....	26
Specific Activities - 2004.....	27
Specific Activities - 2005.....	28
SPIDER Activities - 1999 - 2005.....	29
Publications.....	31
Tables.....	32
Table 1 - Spurious and SPIDER Reports by Year.....	32
Table 2 - Spurious Reports by Status Code, Year.....	32
Table 3 - SPIDER Reports by Source, Year.....	33
Table 4 - SPIDER Reports, Work-relatedness by Year.....	33
Table 5 - SPIDER Reports by Exposure Location.....	34
Table 6 - SPIDER Reports by Product Type.....	35
Table 7 - SPIDER Reports by Chemical Class.....	36
Table 8 - SPIDER Reports - Status Codes by Source.....	37
Table 9 - SPIDER Reports - Grouped Status Codes by Source.....	38
Table 10 - All Reports, Overall Efficacy of Sources.....	38
Appendices.....	39
STATE SANITARY CODE.....	40
NIOSH Case Classification.....	44

List of Abbreviations

AChE	Acetylcholinesterase
ATSDR	Agency for Toxic Substances and Disease Registry
BOH	Bureau of Occupational Health
CEH	Center for Environmental Health
CSTE	Council of State and Territorial Epidemiologists
IPM	Integrated Pest Management
NIOSH	National Institute for Occupational Safety and Health
NYCDHMH	New York City Department of Health and Mental Hygiene.
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OTC	Over-the-counter (general use pesticides)
PCC	Poison Control Center
PPR	Pesticide Poisoning Registry
USEPA	United State Environmental Protection Agency

Abstract

General Goals of the Grant

This grant supported two independent but related efforts within the NYS Department of Health. The first of these was the improvement of case ascertainment, follow-up and investigation of pesticide poisonings. The second was the development of computer software to store, analyze and report case information. Findings in each area are discussed separately below.

Case ascertainment, follow-up and investigation

Pesticide poisonings are a reportable condition in NYS, under Part 22 of the State Sanitary Code (Appendix). Reporting entities are “physicians, clinical laboratories and health care facilities”. Reporting by clinical laboratories is upon completion of an analysis of a blood cholinesterase test that is below the normal range (an effect of the so-called cholinesterase inhibiting pesticides in the organophosphate and carbamate chemical classes), or tissue analysis for pesticide residues. In practice, there are few laboratories performing, and few physicians ordering, actual tissue analysis for pesticides. This is due the high cost of such tests, and the limited diagnostic value of such tests.

Cholinesterase tests are valuable in case ascertainment, but efforts in obtaining these reports must be targeted. While depressed blood cholinesterase levels are a well known effect of some pesticide classes, they are also caused by other medical conditions, including pregnancy, stroke, ALS, and electroshock therapy. In addition, a small percentage of the population has a blood cholinesterase level in the ‘below normal’ range. Reports received from commercial clinical laboratories largely reflect medical tests that are requested as part of normal health care related to these conditions, as well as for pre-surgical screening by anesthesiologists. Unfortunately, such clinical results include only the name of the patient and the provider; in order to determine if these tests are due to a pesticide exposure, follow-up with the health care provider is required. The number of pesticide related cases is minimal, and the effort to make the case ascertainment is not productive.

Valuable reports are received from employers who operate their own laboratory, and screen their employees who handle or apply pesticides as part of routine health and safety practices. Such employer-operated laboratories are cost effective for the employer, are certified by NYS and provide a reliable source of pesticide-related cholinesterase reports. Typically, these employers are commercial lawn care services providers and pesticide manufacturers, formulators or re-packagers. In the last few years, employer-based labs have been supplanted by the use of commercial labs. In some cases it is possible to identify employer-sponsored tests in the stream of clinical reports; the employer, or employer's physician, is identified as the source of the sample.

Physician and health care facility reporting is a dependable source of pesticide poisoning reports. While under-reporting is likely, these cases involve a physician's assessment of the patient, and include an array of signs and symptoms whose presence and time of appearance can be

correlated with the known effects of pesticides. This is important for case evaluation and the case classification scheme incorporated into the software described below.

In addition to the required reporting sources, physicians, health facilities and clinical laboratories, NYS has also pursued reporting by poison control centers. This has met with mixed success. A close relationship with the New York City Department of Health and Mental Hygiene allows the PPR to obtain a monthly upload of PCC data. This upload is performed using a secure file transfer utility in a secure network maintained by NYSDOH and in which both PPR and NYCDHMH have accounts. The Finger Lakes PCC also transmits pesticide poisoning reports quarterly using PDF files and a secure file transfer system.

Unfortunately, no other PCC is able to send reports this way. They have an ability to send reports as e-mail attachments, but this violates DOH security policy; e-mail messages are not secure and may pass through many internet servers in route.

In this aspect of the grant, the funds enabled NYS to 'combat' under-reporting by targeting specific provider populations and exploring new sources of reports.

Software development

NYS implemented its pesticide reporting regulations in 1991. Software was developed to document reports and effort, however the initial software architecture was 'naïve'; pesticide reports turned out to be more complicated than its flat-file structure anticipated. When more than one person was affected by a pesticide application, details of the event narrative had to be entered in every record. Although this was fairly easy to do using 'cut & paste', it resulted in duplicate data that was difficult to maintain changes to the narrative were made. In addition there was no unique identifier for each person; persons with multiple exposures could not be easily matched (this is common for seasonally exposed lawn care workers).

In 1997, NYS began redesigning its software to accommodate multiple persons in the same event, and persons with multiple events. At the same time, NIOSH was developing a consistent set of core variables to be used by states receiving funding to report pesticide poisonings to a national database under the SENSOR program. NYS included compliance with the standard variables as part of the redesign. In 1999, NYS was asked to make the software available to other states, and the application was 'delocalized' and distributed through NIOSH. At that time the software received a new name, SPIDER, an acronym for **SENSOR Pesticide Incident Data Entry and Reporting**. SPIDER is a network ready, multi-user data entry application written in Microsoft Visual FoxPro, a fully relational database development environment. Data is validated against the NIOSH Standard variables definitions through both look-up tables and field validation procedures. It includes an export routine that removes identifiers before data is aggregated at NIOSH.

Through the SENSOR grant, NYS has updated the software annually with new pesticide products registered by EPA, and to accommodate new variables and changed core definitions. In 2005, SPIDER was upgraded to Microsoft Visual FoxPro 9.0.

Summary of Specific Activities Related to the Grant Goals

Outreach to Health Care Providers

Over the course of the grant, PPR staff have conducted outreach with the following organizations:

- All hospital emergency rooms in NYS
- Physicians certified in emergency medicine in NYS
- Physicians certified in occupational health medicine in NYS
- All migrant health care contractors funded by NYS
- Migrant health care providers in NYS
- The major HMOs (13) in NYS
- All Poison Control Centers (5) in NYS and the Poison Education Center
- All Medicaid providers in NYS
- Several Medical Societies
- School Nurses
- All county & city health departments in NYS
- NYCDHMH and providers in their newsletter circulation

In our initial contact, each of these received program posters, brochures, stickers containing the toll-free reporting hotline, and a copy of EPA's *Recognition and Management of Pesticide Poisoning*, 5th edition. Each HMO, Poison Control Center and NYCDHMH included a short article describing the PPR and reporting requirements in their provider newsletter. Each has been contacted annually thereafter.

Evaluation of Health Care Provider Outreach

A survey of physicians to assess barriers to reporting to NYS PPR was conducted in several rural counties with a high number of migrant health care provider visits. The anonymous survey was mailed to all internal medicine, general practice, and emergency medicine and occupational medicine physicians in these counties. Results are discussed in the Findings section of this report.

Software Development

The SPIDER software application was developed to meet the needs of both the funding agency (NIOSH) and state programs.

NIOSH's needs were to capture consistent data from participating states. One of the keys to the success of the SENSOR program has been that all variables, and subsequent changes to them, are done by consensus of all participating states. This assured that data element definitions met NIOSH needs and conformed to state needs and practices as well. This included all states participating in SENSOR, not just those using the SPIDER application.

Coding changes are addressed at meetings twice each year; once in conjunction with the CSTE meeting and once at a meeting hosted by a participating state. In addition, NIOSH supports a list server where states can post questions or discuss coding problems on-line.

The SPIDER software was design to provide the states with features beyond mere reporting capability. Additional data elements were added to assist states in tracking cases and events, and many standard reports were developed according to state needs, e.g. quarterly summaries. The software was written using state-of-the-art relational database, and an event driven (versus menu driven) user interface. The definitions of each standard variable is available to the user though a Help key (F3), and all permissible values for coded variable are selectable using the Lookup key (F2). The software contains an export routine that removes identifiers and packages the data in a ZIP file that can be sent as an e-mail attachment. Additional export routines are included for states who wish to do additional data analysis in 3rd party tools such as SAS.

While SPIDER was initially developed to meet NYS need, many states did not have the resources to develop software themselves. Having a single development location also makes updates consistent. Note that two states, California and Washington, had preexisting software of their own, however both maintain and modify their software to meet the same standards as states using SPIDER. SPIDER states are New York, Oregon, Florida, Louisiana, Texas, Arizona, New Mexico, Michigan and North Carolina.

Highlights / Significant Findings

Evaluation of Reporting Sources

Case ascertainment for pesticide poisoning is problematic. As with many public health surveillance systems, data must be gleaned from as many potential sources as possible. None of these sources is designed to support public health initiatives. The program then must decide which sources merit continued efforts to obtain and process reports.

Clinical Test Results - The most valuable source of clinical test results is the employer-ordered test for cholinesterase depression caused by organophosphate and carbamate pesticides. These tests are based on occupational screenings of persons known to use pesticides. Much less valuable are reports of depressed cholinesterase from general public; these reflect a preponderance of testing for other medical conditions or pre-surgical screening. Due to the paucity of data associated with these reports, the effort required to make a determination of pesticide involvement places an unacceptable burden on PPR staff. If employer-ordered tests are in the same data stream as the general public, it may be possible to identify the company name, or company physician or nurse, as the requester of the test.

Health Care Providers / Health Facilities - Reporting by health care professionals results in solid clinical data that plays an important role in case evaluation and follow-up. Exposed persons can be tracked and contacted quickly, allowing a timely follow-up that can help reduce or eliminate continued exposure to pesticides. The major difficulty in obtaining such reports derives from the burden reporting places on already busy medical professionals, and under-reporting is suspected. The high value associated with these reports initiated a study of the impediments to reporting, which is summarized below, and in detail later in this document.

Poison Control Centers - PCCs provide a different type of pesticide report. In general, PCC data reflect phone calls made by citizens; these may be the result of an actual or suspect exposure, or may be a call for information only. In many cases, the PCC receives no identifying information from the caller. However, some reports do contain enough information to conduct follow-up. A few are calls from emergency responders or emergency room staff seeking advice on treatment in route to, or in, the hospital. In such cases the PCC may collect additional information on the patient, such as a medical outcome. In NYC, the PCC also handles calls related to pets, so judicious filtering of data is required.

Hospital Discharge Data - NYS hospital discharge data is maintained by the SPARCS (Statewide Planning and Research Cooperative System) System. In spite of the fact that much hospital reimbursement is based on SPARCS reporting, the data set is not considered complete until two years past the close of the calendar year. While cases identified by ICD-9 diagnosis codes are accurate, there is no possibility of timely intervention. Because of this, few SPARCS identified cases were followed after the 2000 analysis of 1998 data. Instead, focus was placed on annual reminders to emergency room staff to allow for timely follow-up interventions.

Other NYSDOH Programs - Excellent sources of reports can be found within other DOH programs. Any program which supports medical outreach may identify a pesticide related illness or injury. Within DOH these programs have provided cases to the PPR:

- *Hazardous Substance Emergency Event Surveillance (HSEES)*
An ATSDR program that investigates spills & leaks of hazardous substances.
- *Occupational Health Clinics*
Eight occupational health clinics partially funded by NYS, one of which specializes in agricultural occupational health.
- *Chemical Health Effects Program*
An ongoing program which evaluates chemical toxicity for all aspects of DOH involvement in environmental health, including risk assessments for water & food contaminations. Receives EPA 6(a)(2) Notices.
- *Agricultural Nurse Program*
A NIOSH funded program that focused on all aspects of farm and agriculturally related accidents, injuries and poisonings, (funded from 1991 to 2000).
- *Indoor Health Assessment Section*
This group investigates complaints of indoor air problems, and if pesticide-related, refers symptomatic individuals to the PPR

These sources, in a sense, pre-select cases to report to the PPR, since, through their own investigations, the programs identify valid cases. (This works in both directions, since some PPR reports are also shared with HSEES.)

Evaluation of Health Care Provider Outreach

Awareness of the NYS PPR and its reporting requirements was identified as the most prominent barrier to reporting to the Registry, followed by the costs associated with reporting, difficulties recognizing pesticide poisoning and the belief that there are no benefits of reporting patients to public health authorities. Physician's responses did not vary depending on whether or not they evaluated farmers and their families, or whether or not they evaluated migrant farm workers.

Awareness of the NYSPPR was less of a barrier for physicians who reported having heard about the PPR prior to receiving the survey (as compared to those who had not) and for physicians specializing in emergency medicine (as compared to those specializing in internal medicine, family practice, or occupational medicine). Physician's written comments focused on their lack of awareness about the New York State Pesticide Poisoning Registry and program, their need for information about reporting and diagnosing pesticide related conditions, suggestions for outreach materials and how to ease reporting to the NYS PPR.

Translation of Findings

Finding #1 - Health Care Professionals



This category includes the determination, or suspicion, of pesticide poisoning and the role played by a trained health care professional (physician, nurse, physician's assistant). This would normally occur in a hospital, migrant or occupational health clinic, or emergency room. The initial contact with these organizations should emphasize that the report triggers a public health action which provides a service which the above reporter cannot provide. For NYS, this includes advice to the public regarding IPM and PPE, while for an employer, may entail industrial hygiene evaluation, a rather costly service if obtained through commercial providers.

Finding #2 - Clinical Laboratories



The characteristic clinical test for pesticide poisoning is the decreased activity of the enzyme acetyl cholinesterase (AChE) resulting from exposure to organophosphate and N-methyl carbamate pesticides. Unfortunately, this analyte is also an important tool in the diagnosis of other medical conditions and pre-surgical assessments; the number of reports will far exceed those due to pesticide exposure. Even if the physician requesting the test did an occupational or exposure assessment that suggested pesticide exposure, this information would not be available to the laboratory to flag a suitable public health report. Perhaps the only exception would be for those employers who routinely screen their employees for low AChE, however, this is rare.

Finding #3 - Poison Control Centers



Poison Control Centers (PCCs) receive an extremely heterogeneous pattern of calls. These may be simple questions from a citizen, or a request for treatment advice by a physician. Many of the former calls will not contain enough information to do public health follow-up, while calls of the latter type may actually include substantial follow-up information gathered by the PCC. Use of PCC data must be judicious.

Finding #4 - Other NYSDOH Programs



Arguably the best source of reports. The cases are referred by other programs after investigation, and are more likely to represent true pesticide exposures.

Finding #5 - Remaining Sources



A small number of valid exposure reports are obtained from other state government agencies, such as NYS DEC, the 'non-objective' reports from exposed persons, co-workers or friends, and occasionally newspaper articles.

Outcomes / Relevance / Impact

The PPR receives hundreds of reports each year. For many of these, the PPR cannot determine the circumstances of exposure; we may not be able to locate the reported person, or the person does not wish to provide the information. Some sources, such as Poison Control Centers, only receive data provided by the caller, and is often blank in the report. Reports from clinical laboratories usually entail a call to the physician ordering the test. This often confirms that no pesticide is involved, or the test was for specific disease diagnosis. Reports of this nature are placed in the Spurious database. The reason for placing these in Spurious is noted with a status code.

All physician reports (a required reporter in NYS) and all reports which permit detailed follow-up are entered in the SPIDER database. These detailed investigations may also reveal that no pesticide was involved, or fail to locate the affected person. (No attempt to reach the affected individual is made if the exposure is intentional in nature.) In SPIDER, the status code reflects the degree of certainty that the reported health effects are in fact related to a pesticide exposure. The criteria and values for these status codes are assigned according to NIOSH protocol (Appendix II).

This discussion utilizes the data tables at the end of the document.

Nature of 'Spurious' Data

Spurious data is comprised of reports for which follow-up is either not possible or for which no evidence can be found for suspecting pesticide involvement. (Table 2 - Spurious reports by Status Code, Year)

Use of Poison Control Center Data

In an attempt to identify current poisonings, we enlisted the help of the five poison control centers in NYS. In cooperation with NIOSH and other states participating in the SENSOR Pesticides program, especially Louisiana, the national pesticide poisoning center organization developed an automated process for triggering a report to the state as part of their ToxiCall software. While this automated system works, it only works by sending PCC data by e-mail. This violates NYSDOH security policy (and likely HIPAA) and has not been implemented in NYS. However, NYCDHMH has secure access to their regional PCC database and staff of NYCDHMH provide monthly uploads of data through a secure file transfer mechanism. The Finger Lakes Poison Control Center reports individual cases by uploading an Adobe PDF file through the same system.

The number of reports rose significantly in 2003, when the New York City Poison Control Center began voluntary reporting of cases to the registry. This had a dramatic impact on the number of both SPIDER and Spurious cases, and on the amount of effort needed to conduct proper follow-up. As mentioned in the Abstract, PCC data is very heterogeneous; it includes both human and animal data, and may not provide sufficient data to identify and contact the affected person. In 2004 and after, the PCC data is filtered to remove records identified by the PCC as

'lost to follow-up' by the PCC, exclude non-human reports, and reports for which the PCC could not determine if there was sufficient information that a pesticide was involved.

Table 2 presents the number of reports in the Spurious database. Due to the number of reports originating in the NYC PCC, several new status code values were implemented. Of particular interest are the numbers of children exposed to rodent baits and moth balls which are included here. These children were suspected of ingesting these substances, often seeking treatment in hospital ERs, but no symptoms were presented upon examination or PT/PTT testing.

Use of Clinical Laboratory Data

Reports of low AChE test results generally are not good indicators of pesticide poisoning. The bulk of such test reports are the result of pre-surgical testing or tests conducted for other medical conditions, and often reflect congenitally low AChE. In 2005 we began to receive laboratory reports on NYC Fire Department (NYCFD) personnel who were being screened for potential bioterrorism first responder programs. While the physician conducting these screenings was unaware of any pesticide exposure of these firefighters as part of their normal duties, subsequent follow-up with some individuals indicates that, in fact, many are aware of aerosol cans exploding near them when heated by fire. This is being actively investigated.

Nature of SPIDER data

SPIDER data is comprised of detailed follow-up information derived from interviews with affected persons or family members. While it is sometimes discovered that no pesticide exposure occurred, or if exposed, no symptoms developed, these events and persons initially were suspected to be pesticide exposed by their physician, or because they were part of an event where several persons were poisoned. (Table 3 - SPIDER Reports by Source, Year)

Physician Reporting

Over the course of the grant, various approaches were used to identify pesticide poisoning cases and improve case ascertainment. The primary source of reports is the physician, as enacted in law in NYS. This is both a strength and a weakness. Reports derive much strength from the review provided by a professional health care provider. However, physicians are extremely busy, and reporting is not among their highest priority. The PPR designed its reporting with this in mind, with a toll free telephone number as the primary mechanism. In practice, this call is made by a member of the physician's staff.

Due to the strength of physician reporting, the PPR has conducted targeted outreach to emergency room physicians and migrant worker clinics every year. While this results in a 'baseline' of about 15 reports a year, we believed that there was substantial under-reporting. An anonymous survey conducted in 2004 indicates that many physicians were unaware of the reporting requirement. Several who were aware of the reporting requirement felt there was little value in reporting. (Details of this survey are included in the Highlights / Significant Findings section. Additional efforts based on this survey are discussed in the Translation of Findings Section.)

The number of cases which were followed up to completion (SPIDER cases) were about equal to the number of cases which were either not pesticide related or for which follow up could be not be completed (Spurious). (See Table 1- SPIDEF and Spurious Reports by Year)

Use of DOH data from other programs

These reports are generally excellent. The HSEES program refers all incidents in which pesticides are involved. The Health Assessment program also received EPA 6(a)(2) reports, which are reports that manufacturers must supply to the EPA when a user or physician reports an adverse effect of a registered product. While many of these are old by the time they arrive here, the fact that there was sufficient concern to file the 6(a)(2) report generally indicates a strong linkage of a health effect to a product. In addition, these cases are supported by good recall of the affected person or family, and the correct EPA Registration Number is provided by the manufacturer.

Use of SPARCS data

In 2000, PPR staff conducted follow-up of 40 cases identified through the state's hospital discharge database (SPARCS) as reported for calendar year 1998. The two year lag required for this data base to be considered 'complete' results in data with generally high quality in regard to the likelihood of pesticide poisoning, but is poor in timeliness. As a public health effort, this lag is very problematic. It results in little opportunity to

- impact on-going or subsequent poisonings,
- change behaviors or recommend alternative approaches to pest control (IPM),
- suggest specific PPE use,
- identify and contact multiple persons exposed at the same event.

Currently, we do not have sufficient staff to repeat this effort.

Use of Poison Control Center Data

PCC data also impacted SPIDER data entry in 2003. Since the preponderance of PCC data is from NYC, the data reflects conditions in this large urban area. For example, all reports of the illegal pesticides Tempo, and *Tres Pasitos* are from NYC. Tempo is used to kill cockroaches, and *Tres Pasitos* (aldicarb) is used to kill rodents. Both are highly toxic pesticides normally available only to certified applicators, but available 'on the street' in the Bronx, Brooklyn and Manhattan.

Occupational and Nonoccupational Data

We were initially surprised at the number of nonoccupational reports received by the PPR. Since only certified applicators are allowed to purchase and apply the more toxic pesticides, we had anticipated these being the predominant reports. However, use of over-the-counter products account for *circa* 75% of cases. (Table 4 - SPIDER Reports, Work-relatedness by Year)

Location of Exposures

Table 5 - Spider Reports by Exposure Location, indicates the location of exposures. Many of these sites are locations where pesticide use is common: golf courses, parks, rail and highway rights of way, farms, nurseries and greenhouses. These account for only 10% of reports.

Single Family Homes, Multi-Unit Housing and Mobil Homes account for the majority (63%) of reports and are largely due to improper use of OTC products. (A few are the result of 'illegal' products such as *Tres Pasitos* (for rodents) and *Tempo* (cockroaches) obtained from street vendors. All such cases are identified from NYC PCC reports.)

Interestingly, about 7% of reports (80) originate in offices, retail and service establishments. Pesticides would not normally be expected to be used routinely in these locations. Office exposures typically result from the improper use of OTC products for common pest problems such as roaches, paper mites or spiders. These cases are problematic for two reasons; there is generally no reason for the use of pesticides while employees are in the area that is to be treated, application could be done in the evening or over a weekend, and the use of pesticides in such settings requires a certified applicator.

Exposures by Product Type

Table 6 - SPIDER Reports by Product Type, indicates that insecticides are the most significant contributors to poisonings. Insecticides, insect repellents and insecticides in combination account for 50% of reports. In addition, many products that fall into the 'Unknown' category are insecticides, although these are not exactly defined. (Many emergency room reports are for products described as 'unknown spray can' or 'Black Flag product'. This is one reason we emphasize that product packages should be retained until detailed identification can be made.)

The second most common product type is rodenticides. This was not recognized until NYC PCC began reporting in 2003. These products typically are small packets of poisoned bait which are placed on the floor along baseboards where rats and mice travel. Unfortunately, they are not always out of reach of children. Their appearance, small brightly colored pellets, attract a child's attention.

In addition to the 120 reports in SPIDER, where there is sufficient evidence to suggest that an exposure occurred, there are 97 reports in Spurious.

Exposures by Chemical Class

If exposures are examined by the nature of the products ingredients, the same conclusions are reached; insecticides are the main source of poisonings (Table 7). The substances which are toxic to insects are also toxic to humans. Organophosphorus compounds, N-methyl carbamates and pyrethroids are the most common ingredients that cause problems. Products containing these ingredients account for 47% of exposures.

Coumarins and indandiones are ingredients of rodenticides, and will, over a period 12 to 36 hours, interfere with blood clotting factors causing animals to bleed internally. In order to test for exposure to these products, a blood sample must be drawn and clotting times measured. This can be quite traumatic for children.

Herbicide ingredients are generally of much lower toxicity to humans; there are far fewer reports from these ingredients. These are the chlorophenoxy compounds, organochlorines and dipyridyls, accounting for 39 reports.

SPIDER Status Codes by Report Source Type

Tables 8 and 9 show how status codes are related to reporting sources. In assessing the value of maintaining a reporting relationship with these sources, one needs to know if the source generates a suitable number of reports that are related to pesticide exposure, compared to reports that are not pesticide related, or for which public health follow-up is difficult or impossible.

Each data cell indicates the number of reports for one status code and reporting source. The Row % (R%) column allows the determination the efficiency of that source (i.e. number of valid pesticide related cases vs. the number of unrelated, unlikely or insufficient information reports). The Column % (C%) column allows the comparison of one source with another for each status code.

In Table 9, the status codes are collapsed so that those codes which reflect the likely involvement of a pesticide (whether symptoms were displayed or not) are grouped in the first column, and codes reflecting unlikely involvement of pesticides are grouped in column 2. In addition, the reporting source rows are also collapsed to group similar type, compared to Table 3. Physicians and Health Care Providers are grouped, and Self, Co-worker and Friend reports are grouped.

Table 9 suggests that, of all the sources tapped by the PPR over the course of the grant, laboratory reports provide the least value. This is the only source for which the row % is substantially lower than the others; only 27% are likely to involve a pesticide.

However, this table is somewhat misleading since reports from many of these sources have been triaged; that is, some are entered into SPIDER and some into Spurious.

Overall efficacy of PPR Data Sources

In order to get a better overview of all NYSPPR data reporters, Spurious status codes was placed into SPIDER equivalent reporting source codes:

- AChE tests were matched to SPIDER Lab Reports.
- NYCPP reports were matched to Poison Control Center.
- SPARCS records were matched to Health Care Provider.
- Lost-to-follow-up, out-of-state and remaining codes were matched to 'Other'

This data summary is presented in Table 10.

Only three reporting sources under pesticide related produced 10% or more of reports; these were Physicians, Poison Control Centers and NYSDOH programs. Together these comprise 83% of reports. Lab reports, which are mandated under NYS law, have a very low 'hit rate'; only 5% of lab reports truly are pesticide related.

The remaining sources, although low in number, generally produce reports that are worth following.

Detailed Report

Specific Activities - 1999

Program materials were handed out and displayed in

- October 1999, to over 800 nurse professionals at the New York State Nurses' Association meeting.
- October 1999, to over 200 nurse practitioners at the New York State Coalition of Nurse Practitioners Conference
- December 1999 to approximately 150 individuals attending the Environmental Protection Agency Environmental Justice Grant Writing Conference in New York City.

Outreach material was mailed to 10 group practices of physicians and physician assistants, several individual doctors' offices, and three occupational medicine clinics.

The Medical Director of the Bureau of Occupational Health and Pesticide Poisoning Registry traveled to Long Island, New York, in December 1999. This trip included visits to

- the Long Island Poison Control Center,
- a major medical and physician teaching facility,
- a county-run health clinic which also has migrant outreach programs,
- an organization of migrant advocate groups and
- the New York State Department of Environmental Conservation (NYSDEC) pesticide office for the region.

Specific Activities - 2000

Program materials were handed out and displayed in

- February 2000 to approximately 125 physicians at the Academy of Family Physicians Conference in New York State.
- March 2000, to approximately 120 individuals attending the New York State Association of County Health Officials in Saratoga, New York.

Pesticide Poisoning Registry staff requested an in-depth audit and cooperated with an auditor from the New York State Department of Health Wadsworth Center laboratory certification program to assist in an audit of an out-of-state employer laboratory that was processing blood samples for cholinesterase testing of lawn care workers in New York State. There had been problems with timely reports and missed reports in the past from this facility.

Prevention of Worker Pesticide Poisoning

Industrial hygiene staff provided telephone consultation to a city engineer's office where a worker had been reported with a low cholinesterase test result. Among other activities, the public works employees there apply mosquito control pesticides and anticipated additional activity in

controlling the mosquito spread of the West Nile Virus. Several steps were taken to reduce the likelihood of exposure to the pesticides including the purchase of a new air-conditioned truck for spraying activities, furnishing uniforms, fit-testing employees for respirators, and providing uniform laundering services and improved shower facilities.

In October, the NYSDOH Indoor Air Section brought a school situation to the attention of PPR staff. A gross misapplication of termiticide was exposing both staff and students to Dursban TC. The teachers reported many complaints of symptoms from the children; however only teachers, spending extended periods of time in the affected area, sought medical attention. Staff worked with the teachers and their union to assist them in obtaining appropriate medical follow-up and testing. The investigation identified several violations by the applicator, resulting in a fine of \$7,000 for the exterminating company and a provision that additional applicator training be given to all employees of the company.

The Pesticide Poisoning Registry continued to target workers in the horticultural industry as a population potentially over-exposed to pesticides. Bureau of Occupational Health Industrial Hygiene staff conducted a site visit to a large botanical garden where workers had been reported to the Pesticide Poisoning Registry in prior years. Pesticide applications, a night-time activity, were observed and a follow-up letter sent outlining additional steps recommended to improve worker safety.

An outdoor worker protection fact sheet was designed to deal with protection from mosquito-borne illness and pesticides used for mosquito control. This was in response to the West Nile Virus outbreak and pesticide application response in New York State in 1999.

Staff worked with the New York State Department of Environmental Conservation and Cornell Cooperative Extension on a washing machine magnet with laundering instructions in Spanish for pesticide contaminated work clothing. These magnets were distributed at migrant housing facilities by sanitarians and other DOH staff.

Pesticide Poisoning Registry staff worked with the New York State Department of Health Division of Legal Affairs on a concern of an occupational medicine practice over confidentiality of information shared on their patients. A letter was sent from our counsels' office assuring that the Pesticide Poisoning Registry would maintain the confidentiality of health information of an employee and that the cooperation of the practice made it possible to investigate several workplace settings.

Pesticide Poisoning Registry staff assisted the New York State Department of Environmental Conservation (NYSDEC) with a product registration issue that would have affected lawn care workers and others. The Environmental Protection Agency (EPA) had registered two pesticide formulations with different active ingredients and EPA registration numbers but identical product names. The registrant asserted that there was no cause for alarm as the known health effects of the products were similar and negligible. Based on the fact that poisoning victims frequently do not provide an EPA registration number (verified by all NYS PCCs), and due to the importance of identifying products that may cause previously unrecognized health effects, we

expressed concern to the EPA about this practice. We sent a letter to NYSDEC assisting in the New York State denial of a registration for two products registered in this manner by EPA.

Following reports of patients with health problems related to exposure to products recalled by the EPA (AllerCare), Pesticide Poisoning Registry staff contacted the EPA to report continued advertising of the products in New York State. This resulted in a second public announcement of the recall. We also notified the NYSDEC of products, not registered for use in this state, being sold and shipped into New York State by mail order.

SPARCS (Statewide Planning and Research Cooperative System) data was used to identify 38 hospitals with accidental pesticide poisonings reported among their 1998 hospital discharges. These hospitals had 50 discharges during that year that were coded as accidental pesticide poisonings. Of these, thirty two were determined to correctly be acute pesticide poisonings cases to be entered into SPIDER. Seven were identified as already having been reported to the New York State Department of Health. The hospitals mentioned above were among the 40+ hospitals mailed educational packets with information on reporting to the New York State Pesticide Poisoning Registry and on pesticide poisoning in general. (SPARCS data is typically 2 years old before it can be considered complete.)

In the fall of 2000, WNV-related surveillance data was reviewed to identify cases potentially reportable to the PPR. Such cases were investigated and added to the registry as appropriate.

In October 2000, 45 physicians attended the 3rd annual conference of the American College of Obstetricians and Gynecologists and the New York Academy of Family Physicians meeting where PPR materials were made available.

In October 2000, 800 nurses attended the Statewide Conference for New York State Nurses. PPR materials, as well as ATSDR case studies resulting from exposures to pesticides, were displayed and distributed.

In November 2000, 50 physicians attended the New York Upstate Scientific Meeting - New York State Society of Internal Medicine conference where program materials were distributed.

In December 2000, the medical director of the PPR met with the regional Poison Control Center (PCC) directors from around the state, at their annual meeting. He provided an overview of the program and the PCC role to assist us in meeting program goals. Although not a mandatory reporting organization, the PCCs agreed to report situations of continued health risk to individuals or groups and to report any cases involving medical follow-up.

Specific Activities - 2001

In March 2001, the PPR contacted each of the 286 hospital emergency departments in New York State. Information on filing reports with the PPR was provided to each facility. The Environmental Protection Agency (EPA) CD-ROMs, containing the EPA pesticide handbooks, were included in the mailing to the emergency rooms, as well as a physician fact sheet on West Nile Virus-related pesticide health effects.

In March 2001, PPR, ATSDR, EPA and other pesticide poisoning related information was mailed to a large occupational medicine practice in the western part of the state. Following reports of depressed cholinesterase from a variety of workers screened there over the years, the practice's occupational health nurse was providing training to clinic staff on the use of that screening tool as well as help on interpretation of results and recommended follow-up.

Staff attended a meeting of 200 school nurses at the New York State Association of School Nurses meeting held in March 2001 and distributed information on the Pesticide Poisoning Registry.

In June, medical staff addressed county medical society

A nurse with CEH distributed materials at the NYS Association of Occupational Nurses meeting in Buffalo. Approximately 50 nurses were in attendance.

Also in Buffalo, 150 physicians affiliated with the NYS Family Practice Society met for a bioterrorism conference. The CEH nurse distributed educational materials on chemical exposure, including pesticides.

In November, 2001, The NYS Nurses Association held their state-wide meeting in NYC. Over 1500 nurses were in attendance; PPR brochures and posters were available.

Also in November, the American College of Physicians-American Society of internal Medicine met in Rochester. The 220 physicians were provided with emergency room packets, ATSDR studies and PPR posters.

Staff included physicians' assistants in our outreach effort, as they often are emergency providers, especially in rural areas. Over 600 people attended the Educational Conference and EXPO for the New York State Society of Physician Assistants in Saratoga, New York, where PPR educational materials were displayed and distributed.

At the end of calendar year 2000, we evaluated the success of our outreach effort on Long Island in December 1999. Reports from the Long Island PCC went from 13 and 5 in calendar years 1998 and 1999 respectively, to 26 reports during calendar year 2000. This 5-fold increase in reporting from 1999 to 2000 indicates the potential effectiveness of outreach activities targeted to the NYS PCCs. Of the 26 reports from Long Island PCC in 2000, all were new to the Registry and 22 were entered into SPIDER. The others were not entered because either there was no illness or in one case, the exposure turned out not to be a pesticide. Of those entered into SPIDER, 4 were occupationally exposed.

Center staff tracked hits to Department of Health web sites during calendar year 2000. Information for medical providers on the PPR appears on this web site. There were 4228 hits to the medical providers site that reminds them to report pesticide poisoning cases to the PPR. Included on this web page was information on the health effects of West Nile Virus mosquito

control pesticides used in summer and fall 2000. These fact sheets appear in both English and Spanish and over 10,000 hits were tracked to them over calendar year 2000.

Pesticide Poisoning Registry materials were mailed to group practices of both physicians and physician assistants, several individual doctors' offices, and occupational medicine clinics.

SPARCS (Statewide Planning and Research Cooperative System) data from January 1999 through June 2000 were reviewed and 111 hospital admissions were identified as possible pesticide poisonings using selected Internal Classification of Disease codes (ICD-9 codes) and external cause of injury codes (E-codes). Five were identified as cases already in SPIDER. Hospitals found to be underreporting were contacted to encourage more complete reporting in the future.

Surveillance and Prevention of Worker Pesticide Poisoning

In March 2001, two applicators from a cereal factory were reported to the PPR with depressed cholinesterase test results following a yearly screening. A physician with their occupational medicine group requested assistance from the PPR in interpreting their test results, reviewing their exposure histories and deciding on a re-testing schedule.

The *West Nile Virus Information for Outdoor Workers* fact sheet, developed early in the summer, was placed on the Department of Health web site. By the end of calendar year 2000, Center computer support staff reported 1430 hits to its web page.

As a pilot project, SPARCS (Statewide Planning and Research Cooperative System) data from January 1999 through June 2000 was reviewed and 111 hospital admissions were identified as possible pesticide poisonings using selected Internal Classification of Disease codes (ICD-9 codes) and external cause of injury codes (E-codes). Five were identified as cases already in SPIDER. Medical records for the 106 admissions identified as possible pesticide poisonings that have not been reported to the PPR were requested via mail from the admitting hospital. A follow-up request by telephone was made when necessary. Information on 85 (80%) of the requested medical records were received and are being reviewed. Epidemiology staff will review these records to determine if any trends are present. This may serve to help guide registry staff target case ascertainment and intervention activities in the future.

Other Pesticide Issues

Information on the reporting regulation for pesticide poisonings in New York State was provided to the Louisiana Department of Health as they prepared to set up a surveillance program for pesticide poisonings in their state.

Program information was shared with the New York City Department of Health and Mental Hygiene as they dealt with issues related to the large number of calls for WNV-related pesticide concerns and the monitoring of health effects from the mosquito control effort.

As a result of a death from dinitrophenol (DNP) used for weight loss, staff mailed posters to over 200 gyms in NYS, warning of the illegal sale of this dangerous substance. (DNP is available in bulk as a pesticide active ingredient and was repackaged for sale.)

WNV-related activities included review of surveillance data to identify potential registry cases and the drafting of a report of year 2000 WNV surveillance activities. Those surveillance activities were related to calls received by NYSDOH, PCCs, and Local Health Units from persons reporting health effects they attributed to exposure to WNV-related pesticide applications. Preparations were made to conduct similar surveillance activities in 2001 should WNV-related pesticide applications again be conducted in New York.

BOH industrial hygiene staff developed a draft document to provide guidance on health and safety issues associated with indoor pesticide applications within horticultural settings. The document, "Recommendations for Indoor Pesticide Applications Within Horticultural Settings," is based on the findings from our industrial hygiene evaluations within private, governmental, and academic settings including commercial greenhouses, a large botanical garden, and an agricultural research facility. The facilities that we visited differed by size, type of horticulture raised, methods and frequency of pesticide applications, types of pesticides used, number of applicators, and overall mission (e.g. commercial sale, public display, education, research). Despite these variations, we observed numerous similarities in pesticide policies, work practices, and potential health and safety hazards.

An article summarizing 1999 and 2000 WNV surveillance data, was published in *Morbidity and Mortality Weekly Report*. (2)

Specific Activities - 2002

NYSPPR program posters and brochures were mailed to all hospital emergency departments statewide. The mailing included Environmental Protection Agency (EPA) handbooks on pesticide poisoning recognition and treatment.

BOH staff attended a conference aimed at increasing immigrant women's healthcare access. The focus of NYSPPR staff was to establish access to the migrant community through this alliance of organizations and program managers providing services to this target group of patients.

Staff contacted large Health Maintenance Organizations (HMOs) statewide that are providing health coverage to millions of New Yorkers. The HMOs published an article concerning reporting to the NYSPPR for their provider newsletters that will reach thousands of clinicians.

Both the NYSDOH Center for Environmental Health outreach nurse and the NYSPPR nurse attended Empire Farm Days in summer 2002. The Farm Days were attended by approximately 75,000 individuals involved in all aspects of agricultural production in the United States and Canada. The nurses educated farmer owners/operators and farm laborers about proper personal protective equipment (PPE) for pesticide application activities, taking the least toxic approach to pest control, and protection from the risk of West Nile virus while working outdoors. They also educated farm families on ways to reduce their risk of exposure to farm chemicals. Hundreds of

copies of fact sheets, brochures and other materials about the safe handling of pesticides, appropriate PPE use, repellent use and prevention of pesticide drift were distributed.

During the fall harvest season, staff telephoned migrant healthcare coordinators to remind them of the NYSPPR and to report any suspected poisonings. NYSPPR posters and brochures were sent to the coordinators to distribute to their providers networks.

The Center for Environmental Health (CEH) occupational health nurse attended the 51st Annual New York State Association of Occupational Health Nurses Conference in Sleepy Hollow, New York, in October. Among the pesticide-related materials distributed to the nurses were: the NYSDOH *Fact Sheet for Healthcare Providers- Information related to insecticide use for preventing the spread of West Nile Virus*, the NYSDOH brochure *Reducing Pesticide Exposure*, NYSPPR brochures and posters, the EPA handbook, *Recognition and Management of Pesticide Poisonings*, the Agency for Toxic Substances and Disease Registry case studies on cholinesterase and taking exposure histories, and information on personal protective equipment (PPE) for pesticide applicators and handlers.

Also in October, the outreach nurse attended the NYS Association of School Nurses Conference where the above materials were distributed.

Program materials and pesticide educational materials were sent to two occupational medicine physicians, and the physicians' assistant and nurse practitioner working with them, after their patient was reported with a depressed cholinesterase test result.

Program materials were distributed at the spring meeting of clinicians from the NYS Occupational Health Clinic Network.

Mailing information was acquired and a mailing prepared for emergency medicine physicians, occupational medicine physicians and preventive medicine physicians. This mailing will include NYSPPR posters and brochures as well as the EPA handbook, *Recognition and Management of Pesticide Poisonings*.

Specific Activities - 2003

BOH staff developed a cooperative initiative with the New York City Department of Health and Mental Hygiene (NYCDOHMH) and the New York City Poison Control Center (NYCPCC) to receive reports from NYCPCC that meet pre-determined criteria indicating potential pesticide poisoning. This resulted in approximately 117 additional reports included in the NYSPPR, which represents a significant increase beyond typical annual reporting numbers.

During 2003, worker safety educational materials related to pesticide handling in English, Spanish and/or Creole were sent to migrant outreach workers and health providers throughout the state for distribution to seasonal and migrant farm laborers.

Illegal street sales of *Tres Pasitos* and *Tempo* were reported to the New York State Department of Environmental Conservation (NYS DEC) whenever there was enough information for an investigation.

In July 2003, a mailing was sent to physicians state-wide whose specialty was listed as emergency medicine, occupational medicine or general preventative medicine. They received a CD containing the EPA handbook, a poster, brochures and a copy of the reporting regulations.

A trial data transfer of calls received by a regional Poison Control Center was initiated in spring 2003 to capture missing reports from major hospital settings in a large city. This was part of the effort to develop a partnership with the New York City Department of Health and Mental Hygiene to improve reporting and share expertise. Follow-up of these reports is ongoing.

NYSPPR staff worked with one New York State Poison Control Center to pilot test the new NIOSH auto-upload function in TOXICALL. Unfortunately, this functionality was based on ordinary e-mail, which would compromise patient confidentiality. The PCC currently uploads PDF files containing information from reportable patients using a secure electronic document submission system.

In October 2003, the Center for Environmental Health (CEH) occupational health nurse attended the New York State Chapter of Occupational Health Nurses conference. At that event she distributed PPR brochures and posters, ATSDR case studies on cholinesterase and taking an exposure history, the NYSDOH brochure, *Fight the Bite*, about pesticide use and other measures to prevent the spread of West Nile Virus, and a variety of other NYSDOH-produced brochures on repellent use and ticks.

Parents of children exposed to pesticides were mailed educational materials related to home pesticide handling and integrated pest management in Spanish or English as needed.

Specific Activities - 2004

Staff participated in the 2004 Capital District Pesticide Applicator's Recertification Day, held in Albany, NY, sponsored by the Cornell Cooperative Extension. Staff provided safety and health materials for the more than 125 applicators in attendance. The applicators were working for recertification credits in categories that included: ornamental and turf, agricultural, and structural and rodent/termite. Registry staff distributed washing machine magnets containing instructions on the handling of pesticide contaminated clothing and the US EPA book Protect Yourself from Pesticides- A Guide for Pesticide Handlers. Also distributed were NYSDOH-produced materials including the brochure "Reducing Pesticide Exposure", the West Nile Virus Information for Outdoor Workers fact sheet (26), and the "Tick and Insect Repellents" fact sheet (30). DOH-affiliated occupational health clinic brochures were available to attendees as well.

PPR staff provided applicator health and safety materials for participants in a county Cornell Cooperative Extension 30-hour training course for new applicators. An industrial hygienist from a NYSDOH-affiliated occupational health clinic provided training for one section of the 6-day event. The NYSPPR provided the slides for that portion of the program.

Migrant outreach workers were contacted and mailed pesticide safety materials in as many as 6 languages, providing information on reducing or preventing pesticide exposures for migrant and seasonal agricultural workers and their families during the annual growing and harvesting seasons.

Both the NYSDOH Center for Environmental Health outreach nurse and the NYSPPR nurse attended Empire Farm Days in summer 2004. The Farm Days were attended by approximately 75,000 individuals involved in all aspects of agricultural production in the United States and Canada. The nurses educated farmer owners/operators and farm laborers about proper personal protective equipment (PPE) for pesticide application activities, taking the least toxic approach to pest control, and protection from the risk of West Nile virus while working outdoors. They also educated farm families on ways to reduce their risk of exposure to farm chemicals. Hundreds of copies of fact sheets, brochures and other materials about the safe handling of pesticides, appropriate PPE use, repellent use and prevention of pesticide drift were distributed.

A vineyard applicator was referred to Industrial Hygiene (IH) staff after becoming ill following an 8½-hour spray day. NYSPPR staff provided him with information on personal protective equipment, cholinesterase testing, handling of pesticide contaminated clothing and NYS DOH-affiliated occupational health clinics

In February 2004, individuals training to become turf and ornamentals pesticide applicators were provided with the Environmental Protection Agency (EPA) book, Protect Yourself from Pesticides - A Guide for Pesticide Handlers, They also were given washing machine magnets with instructions for laundering pesticide contaminated clothing and brochures developed by the NYSDOH and NYS DEC entitled, "Pesticide Spray Drift", outlining techniques for preventing off target pesticide applications. The NYSPPR provided training slides for an IH from a DOH-affiliated clinic who taught some of the program.

In March 2004, individuals seeking recertification credits in 34 different categories of commercial pesticide application were provided with the above-listed materials and also the EPA publication, Protection for Pesticide Handlers, Protect Yourself- Brush Up on Covering Up. Evaluation Activities

A survey of physicians in several rural counties with high number of migrant health care provider visits was developed to assess barriers to reporting to NYSPPR. The survey was anonymous and mailed to all internal medicine, general practice, emergency medicine and occupational medicine physicians in these counties. Results will assist in planning future outreach activities for migrant health care providers and other rural health care providers.

Specific Activities - 2005

In March, PPR materials were distributed to pesticide applicator attending a recertification training event.

Also in March, these materials were distributed at the annual pre-seasonal meeting of all DOH funded contractors providing services under the Migrant and Seasonal Farm worker (MSFW) program. Approximately 900 water bottles carrying a hand washing and pesticide safety message (English, Spanish and Haitian Creole) were distributed the MSFW outreach workers.

In April, PPR staff provided a display at the NYSDEC/USEPA Region II pesticide inspector training conference in Saratoga Springs, and a toxicologist spoke to the attendees about PPR activities.

In June, all hospital emergency rooms in NYS again received a mailing that included the EPA "Recognition of Pesticide Poisoning" handbook, posters and stickers with the 800 number for reporting.

PPR staff attended Empire Farm Days in summer 2005. The Farm Days were attended by approximately 75,000 individuals involved in all aspects of agricultural production in the United States and Canada. The nurses educated farmer owners/operators and farm laborers about proper personal protective equipment (PPE) for pesticide application activities, taking the least toxic approach to pest control, and protection from the risk of West Nile virus while working outdoors. They also educated farm families on ways to reduce their risk of exposure to farm chemicals. Hundreds of copies of fact sheets, brochures and other materials about the safe handling of pesticides, appropriate PPE use, repellent use and prevention of pesticide drift were distributed.

SPIDER Activities - 1999 - 2005

SPIDER is updated every year. The update always contains an update to the EPA Pesticide Product database. This includes all new manufacturer products and all new distributor products. In general, the latest data is downloaded from EPA in February, merged into SPIDER, and the SPIDER update distributed in June at the CSTE meeting. Training is provided during this meeting as well.

In addition to the EPA data update, the installation program will also contain new or changed data fields. These fields will have been established through meetings and on-line discussion among state programs who may have special needs. Rather than incorporating every change requested, a consensus approach is taken so changes will benefit all states. For example, the state of Oregon asked to be able to track events related to specific crops, whether the exposure happened during field application, post harvest processing, transport or delivery. A new crop codes was added for this, based on existing federal codes. This ensured compatibility with other data systems using the same codes. In addition, new canned reports have been added to meet state reporting requirements, and annual reporting to the funding agency. There are also special export routines so data can be analyzed in sophisticated statistical applications, such as SAS.

The initial version of SPIDER was developed in 1998, using Microsoft Visual FoxPro 3.0 as the underlying data engine, and Visual ProMatrix 3.0 as the rapid development platform. In 1999, SPIDER was upgraded to use Visual FoxPro 5.0 and Visual ProMatrix 5.0. In 2004, SPIDER was upgraded to use Visual FoxPro 9.0 and Visual ProMatrix 9.0.

NIOSH Conference of ABLES and SENSOR Grant Recipients CSTE Annual Meetings:

- “SPIDER - Version 2.0 Upgrade Features and Installation”, Albuquerque, NM, June 2005
- “SPIDER - Version 1.0e Upgrade Features and Installation”, Boise, ID, June 2004
- “SPIDER - Version 1.0d Upgrade Features and Installation”, Hartford, CT, June 2003
- “SPIDER - Version 1.0c Upgrade Features and Installation”, Kansas City, MS, June 2002
- “SPIDER - Version 1.0b Upgrade Features and Installation”, Portland, OR, June 2001
- “SPIDER - Version 1.0a Upgrade Features and Installation”, New Orleans, LA, June 2000
- “SPIDER - Version 1.0 Upgrade Features and Installation”, Madison, WI, June 1999
- “SPIDER - SENSOR Pesticide Data Entry and Reporting” Preview , E Lansing, MI, May 1998

Publications

1. NIOSH [2005] Pesticide-Related Illness and Injury Surveillance, A How-to Guide for State Based Programs, NIOSH Publication Number 2006-102.
2. Mauer MP , Rosales R, Sievert J, et al. Surveillance for acute insecticide-related illness associated with mosquito-control efforts – nine states, 1999-2002. *Morbidity and Mortality Weekly Report*. 52(27); July 11, 2003.
3. Alarcon WA, Calvert GM, Blondell JM, Mehler LN, Sievert J, Propeck M, Tibbetts DS, Becker A, Lackovic M, Soileau SB, Das R, Beckman J, Male DP, Thomsen CL, Stanbury M. Acute illnesses associated with pesticide exposures at schools. *JAMA* 2005; 294: 455-565
4. Calvert GM, Plate DK, Das R, Rosales R, Shafey O, Thomsen C, Male D, Beckman J, Arvizu E, Lackovic M. Acute occupational pesticide-related illness in the US, 1998-1999: surveillance findings from the SENSOR-pesticides program. *Am J Ind Med* 2004;45:14-23.
5. Calvert GM, Mehler LN, Rosales R, Baum L, Thomsen C, Male D, Shafey O, Das R, Lackovic M, Arvizu E. Acute pesticide-related illnesses among working youths, 1988-1999. *Am J Public Health* 2003; 93:605-610.
6. Petersen AM, Calvert GM, Sievert J, Mehler L, Das R, Harter L, Romoli C, Becker A, Ball C, Male D, Schwartz A, Acute Pesticide Poisoning in US Retail Industry, 1998-2002, *Journal of Environmental and Occupational Medicine*, (Submitted, August 2005)

In preparation

Calvert GM, Barnett M, Mehler L, Becker A, Das R, Beckman J, Male DP, Sievert J, Thomsen CL, Morrissey B, Acute pesticide-related illnesses among emergency responders, 1993-2002.

Tables

Table 1 - Spurious and SPIDER Reports by Year

Year	SPIDER	Spurious
1998	123	74
1999	101	100
2000	171	127
2001	113	99
2002	56	82
2003	168	262
2004	196	112
2005	248	241
Total	1176	1097

Table 2 - Spurious Reports by Status Code, Year

		1998	1999	2000	2001	2002	2003	2004	2005	Total
Lost to follow-up	0						29	40	53	122
Surgical Patient	1	27	49	33	34	27	17	20	12	219
Electroconvulsive Therapy	2		2	2	2		1	3	2	12
Out-of-State	3		1		2	1	3	5	7	19
SPARCS	4			32						32
Predates Registry	5	3	1	1				5		10
Moved to SPIDER	6							11		11
Not a case	7	5	9	41	17	11	18		19	120
Bad Test	8	2	6	1	1	8			2	20
Other low AChE	9	37	32	17	43	35	39	23	24	250
NYCPCC Asymp Child	10						33			33
NYCPCC Rodent Bait	11						89	3	5	97
NYCPCC Mothballs	12						9			9
NYCPCC Other Child	13						23			23
NYCPCC 207 Code (Lost)	14							1		1
Other clinical test	15						1	1		2
NYCFD - AChE Low	16								104	104
NYCFD - AChE not low	17								11	11
AChE not low	18								2	2
Uncoded at present	99									
Total		74	100	127	99	82	262	112	241	1097

Shaded cells indicate data source unavailable or code not used/defined.

Table 3 - SPIDER Reports by Source, Year

Source	1998	1999	2000	2001	2002	2003	2004	2005	Total
Physician	6	1	8	12	3	4	7	7	48
Poison Control Center	35	25	45	9	19	138	140	120	531
Other Health Care Professional	19	6	16	7	3	4	10	3	68
Laboratory Report	33	35	13	12	12	7	14	5	131
Other Government Agency	1	0	7	3	2	0	2	3	18
Newspaper	1	0	0	44	0	0	0	0	45
Self report	3	3	8	2	3	4	5	8	36
Co-worker Report	0	0	0	0	0	1	0	1	2
Friend or Relative	5	2	4	1	0	4	6	13	35
Other NYSDOH Program	18	26	64	23	14	6	12	80	243
Other	2	3	6	0	0	0	0	0	11
Unknown at present	0	0	0	0	0	0	0	8	8
	123	101	171	113	56	168	196	248	1176

Table 4 - SPIDER Reports, Work-relatedness by Year

Year	Work Related		Not Work Related		Total
1998	43	35%	80	65%	123
1999	46	46%	55	54%	101
2000	62	36%	109	64%	171
2001	51	45%	62	55%	113
2002	17	30%	39	70%	56
2003	21	13%	147	88%	168
2004	28	14%	168	86%	196
2005	32	13%	216	87%	248
	300	26%	876	74%	1176

Table 5 - SPIDER Reports by Exposure Location

	1998	1999	2000	2001	2002	2003	2004	2005	Total
Farm	5	7	2	4	2	1	2	5	28
Nursery	1	1		1			1	1	5
Greenhouse	2			1	1	1		1	6
Single Family Home	56	42	54	12	30	56	59	79	388
Mobil Home		1	3			2	4		10
Multi-unit Housing	14	7	30	7	4	83	90	103	338
Residential Institution	1		1		3			2	7
School			16	2		1		3	22
Day care facility					1				1
Prison		1					1		2
Hospital	3			1	1		1		6
Other Institution			7				1		8
Pesticide Mfg & Formulation	3		12	1		2		1	19
Industrial Facility	2	2		3		1	1		9
Other Manufacturing	1	1			1	1		1	5
Office/Business	2	5	12	16	3	2	4	2	46
Retail Establishment	1	1	2	1		6	1	3	15
Service Establishment		3	4				2	10	19
Road / Rail	1	1	8	5		1			16
Park			2	40	1	1	3		47
Golf Course	1	4	2	1	1	2		2	13
Private Vehicle			1			1	1	1	4
Public Transportation								2	2
Emergency Response Vehicle	1								1
Other - NOS	4	1	1	4	1	1	3	3	18
Multiple Sites	10	7	10	11	3	2	5	1	49
Unknown	15	17	4	3	4	4	17	28	92
	123	101	171	113	56	168	196	248	1176

Table 6 - SPIDER Reports by Product Type

	1998	1999	2000	2001	2002	2003	2004	2005	Total
Insecticides	55	45	86	82	22	39	56	94	479
Insect growth regulators				15		2	2	4	23
Herbicides	7	6	8	5	6	5	10	4	51
Fungicides	3	7	3	5	3	3	2	1	27
Fumigants				4					4
Rodenticides		1	6	1	1	38	41	32	120
Disinfectants / Broad Spectrum	8	2	1	2	4	2	1	22	42
Insect Repellents	1		3			6	3	8	21
Insecticide & Herbicide							1		1
Insecticide & Fungicide	1		2	1	1	1		2	8
Insecticide & Other	3	6	2	15	1	4	4	3	38
Herbicide & Fungicide	1			1		1		1	4
Other	2	1		17	1	2			23
Multiple NOS			1			6	2	1	10
Unknown	66	51	66	19	24	72	83	65	446
	147	119	178	167	63	181	205	237	1297

A person may be exposed to products containing multiple ingredients of different types.

Table 7 - SPIDER Reports by Chemical Class

	1998	1999	2000	2001	2002	2003	2004	2005	Total
Organochlorine	5	1	3	4	1	1	1		16
Organophosphorus (AChE)	52	45	60	53	17	15	11	8	261
N-methyl carbamate (AChE)	22	10	3	5	2	12	5	10	69
Pyrethrins	3	2	3	2	2	3	19	7	41
Pyrethroids	8	12	34	32	15	26	39	67	233
Pyrethrins + Pyrethroids	7	2	3			4	4	5	25
Pyrethrins + Pyrethroids + Other							1		1
Dipyridyl	3			2			1		6
Chlorophenoxy	2	3	2	1		4	2	3	17
Organo-metallic			2			1			3
Inorganic Compounds	2	2	8	4	4	2	12	15	49
Coumarins			9	1		9	11	11	41
Indandiones						4	2		6
Dithiocarbamates	1	1	1	1	2	1	2	1	10
Triazines		2					5		7
AChE + Pyrethrin or Pyrethroid	2	1	2	5	1	2	1	1	15
AChE + Other	3		2				1	1	7
Microbial				14					14
Other	16	26	20	42	14	22	27	50	217
Multiple ingredients NOS	2	1	2	3	2	8	7	13	38
Unknown	32	28	28	11	6	73	78	68	324
	160	136	182	180	66	187	229	260	1400

A person may be exposed to products containing multiple ingredients in more than one chemical class.

Table 8 - SPIDER Reports - Status Codes by Source

Status (Code)	Definite (1)			Probable (2)			Possible (3)			Suspicious (4)			Unlikely (5)			Insufficient Information (6)			Exposed Asymptomatic (7)			Unrelated (8)			Total
	N	R%	C%	N	R%	C%	N	R%	C%	N	R%	C%	N	R%	C%	N	R%	C%	N	R%	C%	N	R%	C%	
Physician	24	21%	17%	30	26%	16%	23	20%	10%	14	12%	7%	2	2%	7%	19	16%	7%	2	2%	2%	2	2%	20%	116
Poison Control Centers	56	11%	39%	65	12%	34%	97	18%	41%	130	24%	65%	11	2%	38%	88	17%	33%	81	15%	83%	3	1%	30%	531
Lab Report	10	8%	7%	3	2%	2%	9	7%	4%	12	9%	6%	2	2%	7%	93	71%	35%	1	1%	1%	1	1%	10%	131
Report from Gov't	0	0%	0%	7	39%	4%	5	28%	2%	1	6%	0%	0	0%	0%	4	22%	1%	0	0%	0%	1	6%	10%	18
Newspaper	1	2%	1%	5	11%	3%	30	67%	13%	2	4%	1%	0	0%	0%	6	13%	2%	1	2%	1%	0	0%	0%	45
Self/Coworker/Friend	4	5%	3%	13	18%	7%	19	0.53	8%	13	18%	6%	6	8%	21%	15	21%	6%	3	4%	3%	0	0%	0%	73
NYSDOH	45	18%	32%	62	25%	33%	55	22%	23%	26	11%	13%	8	3%	28%	37	15%	14%	10	4%	10%	2	1%	20%	245
Other	2	18%	1%	5	45%	3%	1	9%	0%	2	18%	1%	0	0%	0%	0	0%	0%	0	0%	0%	1	9%	10%	11
Not currently known	0	0%	0%	0	0%	0%	0	0%	0%	1	13%	0%	0	0%	0%	7	88%	3%	0	0%	0%	0	0%	0%	8
	142			190			239			201			29			269			98			10			1178

Table 9 - SPIDER Reports - Grouped Status Codes by Source

Source	Pesticide Likely (Codes 1-4,7)			Pesticides Unlikely (Cased 5,6,8)			Total
	N	R%	C%	N	R%	C%	
Physician	93	80%	11%	23	20%	7%	116
Poison Control Centers	429	81%	49%	102	19%	33%	531
Lab Report	35	27%	4%	96	73%	31%	131
Report from Gov't	13	72%	1%	5	28%	2%	18
Newspaper	39	87%	4%	6	13%	2%	45
Self/Coworker/Friend	52	71%	6%	21	29%	7%	73
NYSDOH	198	81%	23%	47	19%	15%	245
Other	10	91%	1%	1	9%	0%	11
Not currently known	1	13%	0%	7	88%	2%	8
	870	74%		308	26%		1178

Column 1 includes

- 1 - Definite
- 2 - Probable
- 3 - Possible
- 4 - Likely
- 7 - Exposed, asymptomatic

Column 2 includes

- 5 - Unlikely
- 6 - Insufficient Information
- 8 - Unrelated

Table 10 - All Reports, Overall Efficacy of Sources

Source	Pesticide related			Not Pesticide Related			Total
	N	R%	C%	N	R%	C%	
Physician	93	63%	11%	55	37%	4%	148
Poison Control Centers	429	62%	49%	265	38%	19%	694
Lab Report	35	5%	4%	714	95%	51%	749
Report from Gov't	13	72%	1%	5	28%	0%	18
Newspaper	39	87%	4%	6	13%	0%	45
Self/Coworker/Friend	52	71%	6%	21	29%	1%	73
NYSDOH	198	81%	23%	47	19%	3%	245
Other	10	3%	1%	285	97%	20%	295
Not currently known	1	13%	0%	7	88%	0%	8
	870	38%	100%	1405	62%	100%	2275

Appendices

STATE SANITARY CODE

PART 22

ENVIRONMENTAL DISEASES

(Statutory authority: Public Health Law, §§ 225[5][t], 206[1][j])

Sec. 22.1	Supplementary reports of spontaneous abortions and fetal deaths for epidemiological surveillance; filing	Sec. 22.6	Reporting of heavy metals in blood and urine
22.2	Supplementary reports of low birth weights for epidemiological surveillance; filing	22.7	Reportable levels of heavy metals in blood and urine
22.3	Supplementary reports of certain congenital anomalies for epidemiological surveillance; filing	22.8	Reporting of certain occupational exposures
22.4	Reporting of occupational lung disease	22.9	Reports: place of filing
22.5	Classification of occupational lung disease	22.1	Effective dates
		0	
		22.1	Reporting of pesticide poisoning
		1	
		22.1	Reportable laboratory tests for pesticide poisoning
		2	

Historical Note

Part (§§ 22.1-22.10) filed May 14, 1981 eff. May 14, 1981. See sec. 22.10 for exceptions.

22.1 Supplementary reports of spontaneous abortions and fetal deaths for epidemiological surveillance; filing. Every physician and hospital shall file a supplementary report with the State Commissioner of Health of each spontaneous abortion or other fetal death occurring naturally. Such report shall be filed within 10 days of the occurrence of such event on such forms as may be prescribed by the commissioner to facilitate epidemiological investigation and surveillance.

Historical Note

Sec. filed May 14, 1981 eff. Oct. 1, 1982

22.2 Supplementary reports of low birth weights for epidemiological surveillance; filing. Every physician, hospital, and person in attendance at live births shall file a supplementary report with the State Commissioner of Health of each live birth for which the birth weight is 2,500 grams (5.2 pounds) less. Such report shall be filed within 10 days of the birth and shall be on such forms as may be prescribed by the commissioner to facilitate epidemiological investigation and surveillance.

Historical Note
Sec. filed May 14, 1981 eff. Oct. 1, 1982

22.3 Supplementary reports of certain congenital anomalies for epidemiological surveillance; filing. Every physician and hospital in attendance on an individual diagnosed within two years of birth as having one or more of the congenital anomalies listed in this section shall file a supplementary report with the State Commissioner of Health within 10 days of diagnosis thereof. Such report shall be on such forms as may be prescribed by the commissioner to facilitate epidemiological investigation and surveillance.

Anencephalus and similar anomalies	Congenital anomalies of genital organs
Spina bifida	Congenital anomalies of limbs
Congenital anomalies of the nervous system	Congenital musculoskeletal deformities
Congenital anomalies of the eye	Other congenital musculoskeletal anomalies
Congenital anomalies of ear, face, neck	Congenital anomalies of the integument
Congenital anomalies of heart	Congenital anomalies of the spleen
Congenital anomalies of circulatory system	Congenital anomalies of the adrenal gland
Congenital anomalies of respiratory system	Congenital anomalies of other endocrine glands
Cleft palate and cleft lip	Multiple congenital anomalies anomaly, multiple NOS
Congenital anomalies of upper alimentary tract	
Congenital anomalies of digestive system	deformity, multiple NOS
Congenital anomalies of urinary system	

Historical Note
Sec. filed May 14, 1981 eff. Oct. 1, 1982

22.4 Report of occupational lung disease. Every physician, health facility and clinical laboratory in attendance on a person with clinical evidence of occupational lung disease, as categorized in section 22.5 of this Part, shall report such occurrence to the State Commissioner of Health within 10 days. Such report shall be on such forms as prescribed by the State Commissioner of Health.

Historical Note
Sec. filed May 14, 1981; amd. filed Aug. 14, 1990
eff. Aug. 29, 1990

22.5 Classification of occupational lung disease. For the purpose of reporting occupational lung disease as required by section 22.4 of this Part, occupational lung disease shall be categorized according to the following probable causative agents or nomenclature as applicable.

Coal workers lung disease	Byssinosis
Silicosis	Bronchitis due to occupational exposure
Asbestosis/Asbestos-related disease	Hypersensitivity Pneumonitis (occupational)
Berylliosis	Occupational Asthma
Talcosis	Other occupational lung disease
Hard metals disease (Tungsten, Cobalt)	

Historical Note

Sec. filed May 14, 1981; repealed, new filed Aug. 14, 1990 eff. Aug. 29, 1990

22.6 Reporting heavy metals in blood and urine. Every physician, clinical laboratory and health facility in attendance of a person with a blood or urine test resulting in a value at or above those listed in section 22.7 of this Part, shall report such occurrence to the State Commissioner of Health within 10 days of the receipt of the results of such test. The report shall be on such forms as prescribed by the State Commissioner of Health.

Historical Note

Sec filed May 14, 1981 eff. Dec. 1, 1981.

22.7 Reportable levels of heavy metals in blood and urine. For purposes of section 22.6 of this Part, the following levels of heavy metals in blood and urine samples are reportable to the State Commissioner of Health:

<i>Metal</i>	<i>Sample</i>	<i>Reportable at or above</i>
Lead	Blood	25 ug/dl
Cadmium	Blood	10 ng/ml
	Urine	5 ug/l
Mercury	Blood	5 ng/ml
	Urine	20 ng/ml
Arsenic	Urine	50 ug/l

Historical Note

Sec filed May 14, 1981, amd. filed Sept. 11, 1986 eff. Sept. 11, 1986

22.8 Reporting of certain occupational exposures. Every employer who employs 100 or more persons shall file annually with the State Commissioner of Health a listing of those employees who, in the course of their employment, used, made or were otherwise exposed to the chemicals and compounds listed in subdivision (a) of this section during the previous year. The listing shall be on such forms as may be prescribed by the State Commissioner of Health.

(a) None.

Historical Note

Sec. filed May 14, 1981; repealed, new filed Aug. 16, 1982; amds. filed Dec. 31, 1982; Dec. 30, 1983; Nov. 24, 1986, eff. Nov. 24, 1986

22.9 Reports: place of filing. All required by this part shall be filed with the Director of the Bureau of Environmental Epidemiology and Occupational Health, Division of Epidemiology, New York State Department of Health, Empire State Plaza, Tower Building, Albany, New York 12237.

Historical Note

Sec. filed May 14, 1981 eff. May 14, 1981

22.10 Effective Dates. The provisions of sections 22.6 and 22.7 of this part shall be effective on December 1, 1981; the provisions of sections 22.4 and 22.5 of this Part shall be effective on April, 1 1982; the provisions of section 22.8, which require the annual reporting of certain occupational exposures not later than September 1st of each year, shall be effective September 1, 1982 for the initial reporting period January 1, 1982 through June 30, 1982; and the provisions of sections 22.1, 22.2 and 22.3 of this Part shall be effective on October 1, 1982.

Historical Note

Sec. filed May 14, 1981 eff. May 14, 1981

22.11 Reporting of pesticide poisoning. Every physician, health facility and clinical laboratory in attendance on a person with confirmed or suspected pesticide poisoning or with any of the clinical laboratory results as described in section 22.12 of this Part, shall report such occurrence to the State Commissioner of Health within 48 hours. This report shall be on such forms or in such manner as prescribed by the State Commissioner of Health.

Historical Note

Sec. filed Aug. 14, 1990 eff. Aug. 29, 1990

22.12 Reportable laboratory tests for pesticide poisoning. For the purposes of section 22.11 of this Part the following laboratory tests are reportable to the State Commissioner of Health:

- (a) Blood cholinesterase levels which are below the normal range established by the clinical laboratory performing the test in accordance with quality assurance requirements established by the permit-issuing agency.
- (b) Levels of pesticides in human tissue samples which exceed the normal range established by the clinical laboratory performing the test in accordance with quality assurance requirements established by the permit-issuing agency.

Historical Note

Sec. filed Aug. 14, 1990 eff. Aug. 29, 1990

NIOSH Case Classification

Case Definition for Acute Pesticide-Related Illness and Injury Cases Reportable to the National Public Health Surveillance System

Clinical Description

This surveillance case definition refers to any acute adverse health effect resulting from exposure to a pesticide product (defined under the Federal Insecticide Fungicide and Rodenticide Act [FIFRA]¹) including health effects due to an unpleasant odor, injury from explosion of a product, inhalation of smoke from a burning product, and allergic reaction. Because public health agencies seek to limit all adverse effects from regulated pesticides, notification is needed even when the responsible ingredient is not the active ingredient.

A case is characterized by an acute onset of symptoms that are dependent on the formulation of the pesticide product and involve one or more of the following:

- Systemic signs or symptoms (including respiratory, gastrointestinal, allergic and neurological signs/symptoms)
- Dermatologic lesions
- Ocular lesions

This case definition and classification system is designed to be flexible permitting classification of pesticide-related illnesses from all classes of pesticides. Consensus case definitions for specific classes of chemicals may be developed in the future.

A case will be classified as occupational if exposure occurs while at work (this includes: working for compensation; working in a family business, including a family farm; working for pay at home; and, working as a volunteer Emergency Medical Technician (EMT), firefighter, or law enforcement officer). All other cases will be classified as non-occupational. All cases involving suicide or attempted suicide should be classified as non-occupational.

A case is reportable to the national surveillance system when there is (see the Classification Criteria section for a more detailed description of these criteria):

- Documentation of new adverse health effects that are temporally-related to a documented pesticide exposure; AND
- Consistent evidence of a causal relationship between the pesticide and the health effects based on the known toxicology of the pesticide from commonly available toxicology texts, government publications, information supplied by the manufacturer, or two or more case series or positive epidemiologic investigations; OR
- Insufficient toxicologic information available to determine whether a causal relationship exists between the pesticide exposure and the health effects

Laboratory criteria for diagnosis

If available, the following laboratory data can confirm exposure to a pesticide:

- Biological tests for the presence of, or toxic response to, the pesticide and/or its metabolite (in blood, urine, etc.);
 - Measurement of the pesticide and/or its metabolite(s) in the biological specimen
 - Measurement of a biochemical response to the pesticide in a biological specimen (e.g. cholinesterase levels)
- Environmental tests for the pesticide (e.g. foliage residue, analysis of suspect liquid);
- Pesticide detection on clothing or equipment used by the case subject.

Classification Criteria

Reports received and investigated by state programs are scored on the three criteria provided below (criteria A, B and C). Scores are either 1, 2, 3, or 4, and are assigned based on all available evidence. The classification matrix follows the criteria section (Table 1). The matrix provides the case classification categories and the criteria scores needed to place the case into a specific category. Definite, probable, possible and suspicious cases (see the classification matrix) are reportable to the national surveillance system. Additional classification categories are provided for states that choose to track reports that do not fit the criteria for national reporting. (Appendix 1 contains frequently asked questions (FAQs) that provide additional clarification on the classification criteria and use of the classification matrix. Appendix 2 lists the characteristic signs and symptoms for several pesticide active ingredients and classes of pesticides.)

A. Documentation of Pesticide Exposure

1. Laboratory, clinical or environmental evidence corroborate exposure (*at least one of the following must be satisfied to receive a score of A1*):

- a. analytical results from foliage residue, clothing residue, air, soil, water or biologic samples;
- b. observation of residue and/or contamination (including damage to plant material from herbicides) by a trained professional

[Note: a trained professional may be a plant pathologist, agricultural inspector, agricultural extension agent, industrial hygienist or any other licensed or academically trained specialist with expertise in plant pathology and/or environmental effects of pesticides. A licensed pesticide applicator not directly involved with the application may also be considered a trained professional.];

- c. biologic evidence of exposure (e.g. response to administration of an antidote such as 2-PAM, Vitamin K1, or repeated doses of atropine);
- d. 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 (these findings must be sufficient to satisfy criteria B.1 under A documentation of adverse health effects);
- e. clinical description by a licensed health care professional of two or more post-exposure health effects (at least one of which is a sign) characteristic for the pesticide as provided in Appendix 2.

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 A2*):

- a. report by case;
- b. report by witness;
- c. written records of application;
- d. observation of residue and/or contamination (including damage to plant material from herbicides) by other than a trained professional;
- e. other evidence suggesting that an exposure occurred.

3. Strong evidence that no pesticide exposure occurred.

4. Insufficient data.

B. Documentation of Adverse Health Effect

1. Two or more new post-exposure abnormal signs and/or test/laboratory findings reported by a licensed health care professional.

2. At least one of the following must be satisfied to receive a score of A2":
 - a. Two or more new post-exposure abnormal symptoms were reported. When new post-exposure signs and test/laboratory findings are insufficient to satisfy a B1 score, they can be used in lieu of symptoms toward satisfying a B2 score.
 - b. Any new illness or exacerbation of pre-existing illness diagnosed by a licensed physician, but information on signs, symptoms and/or test findings are not available or insufficient for a B.1 or B.2.a score.
3. No new post-exposure abnormal signs, symptoms, or test/laboratory findings were reported.
4. Insufficient data (includes having only one new post-exposure abnormal sign, symptom, or test/laboratory finding).

C. Evidence Supporting a Causal Relationship Between Pesticide Exposure and Health Effects

1. Where the findings documented under the Health Effects criteria (criteria B) are:
 - a. characteristic for the pesticide as provided in Appendix 2, and the temporal relationship between exposure and health effects is plausible (the pesticide refers to the one classified under criteria A), and/or;
 - b. consistent with an exposure-health effect relationship based upon the known toxicology (i.e. exposure dose, symptoms and temporal relationship) of the putative agent (i.e. the agent classified under criteria A) from commonly available toxicology texts, government publications, information supplied by the manufacturer, or two or more case series or positive epidemiologic studies published in the peer-reviewed literature;
2. Evidence of exposure-health effect relationship is not present. This may be because the exposure dose was insufficient to produce the observed health effects. Alternatively, a temporal relationship does not exist (i.e. health effects preceded the exposure, or occurred too long after exposure). Finally, it may be because the constellation of health effects are not consistent based upon the known toxicology of the putative agent from information in commonly available toxicology texts, government publications, information supplied by the manufacturer, or the peer-reviewed literature;
3. Definite evidence of non-pesticide causal agent;
4. Insufficient toxicologic information is available to determine causal relationship between exposure and health effects. (This includes circumstances where minimal human health effects data is available, or where there are less than two published case series or positive epidemiologic studies linking health effects to the particular pesticide product/ingredient or class of pesticides.)

Table 1 ~ Case Classification Matrix:

Classification Categories ¹										
CLASSIFICATION CRITERIA	Definite Case	Probable Case		Possible Case	Suspicious Case	Unlikely Case	Insufficient Information	Not a Case		
								Asymptomatic ²	Unrelated ³	
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	1	4	2				3

- 1 Only reports meeting case classifications of Definite, Probable, Possible and Suspicious are reportable to the National Public Health Surveillance system. Additional classification categories are provided for states that choose to track the reports that do not fit the national reporting criteria.
- 2 The matrix does not indicate whether asymptomatic individuals were exposed to pesticides although some states may choose to track the level of evidence of exposure for asymptomatic individuals.
- 3 Unrelated - Illness determined to be caused by a condition other than pesticide exposure, as indicated by a >3¹ in the evidence of >Exposure= or >Causal Relationship= classification criteria.

Comment

For information regarding acute occupational pesticide-related illness and injury, contact the National Institute for Occupational Safety and Health at 1-800-35-NIOSH. For information about acute non-occupational pesticide-related illness and injury, contact the National Center for Environmental Health (NCEH) 770-488-3450. For information concerning regulation and use of pesticides, contact the Office of Pesticide Programs, US EPA, at 703-305-5336. The National Pesticide Information Center (1-800-858-7378) provides information about pesticides, acute pesticide-related illness and injury, and the toxicology and environmental chemistry of pesticides.

For more information about this case definition contact Geoffrey M. Calvert, MD, MPH at NIOSH, telephone 513-841-4448, email: jac6@cdc.gov.

1. 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 US 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.

Please note that adverse health effects resulting from exposure to disinfectant products are not reportable in many states because the volume of reports could overwhelm the state's surveillance system; therefore, these cases will not be routinely reported to the national surveillance system. However, states may collect data on health effects resulting from disinfectant exposure, and report relevant cases to the national surveillance system.

Revised 07/23/03, updated 04/15/05

Title: SENSOR: New York; Sentinel Event Notification of Occupational Risks

Investigator: Robert Stone

Affiliation: New York State Department of Health

State: NY

Telephone: (518) 402-7900

Award Number: 1U60OH008341-01

Start & End Dates: 9/30/2002-9/29/2005

Total Project Funding: \$2,238,705.00

Program Area : Surveillance

Final Report Abstract:

This grant supported two independent but related efforts within the NYS Department of Health. The first of these was the improvement of case ascertainment, follow-up and investigation of pesticide poisonings. The second was the development of computer software to store, analyze and report case information. Findings in each area are discussed separately below.

Pesticide poisonings are a reportable condition in NYS, under Part 22 of the State Sanitary Code (Appendix). Reporting entities are "physicians, clinical laboratories and health care facilities". Reporting by clinical laboratories is upon completion of an analysis of a blood cholinesterase test that is below the normal range (an effect of the so-called cholinesterase inhibiting pesticides in the organophosphate and carbamate chemical classes), or tissue analysis for pesticide residues. In practice, there are few laboratories performing, and few physicians ordering, actual tissue analysis for pesticides. This is due the high cost of such tests, and the limited diagnostic value of such tests.

Cholinesterase tests are valuable in case ascertainment, but efforts in obtaining these reports must be targeted. While depressed blood cholinesterase levels are a well known effect of some pesticide classes, they are also caused by other medical conditions, including pregnancy, stroke, ALS, and electroshock therapy. In addition, a small percentage of the population has a blood cholinesterase level in the 'below normal' range. Reports received from commercial clinical laboratories largely reflect medical tests that are requested as part of normal health care related to these conditions, as well as for pre-surgical screening by anesthesiologists. Unfortunately, such clinical results include only the name of the patient and the provider; in order to determine if these tests are due to a pesticide exposure, follow-up with the health care provider is required. The number of pesticide related cases is minimal, and the effort to make the case ascertainment is not productive.

Valuable reports are received from employers who operate their own laboratory, and screen their employees who handle or apply pesticides as part of routine health and safety practices. Such employer-operated laboratories are cost effective for the employer, are certified by NYS and provide a reliable source of pesticide-related cholinesterase reports. Typically, these employers are commercial lawn care services providers and pesticide manufacturers, formulators or re-packagers. In the last few years, employer-based labs have been supplanted by the use of commercial labs. In some cases it is possible to identify employer-sponsored

tests in the stream of clinical reports; the employer, or employer's physician, is identified as the source of the sample.

Physician and health care facility reporting is a dependable source of pesticide poisoning reports. While under-reporting is likely, these cases involve a physician's assessment of the patient, and include an array of signs and symptoms whose presence and time of appearance can be correlated with the known effects of pesticides. This is important for case evaluation and the case classification scheme incorporated into the software described below.

In addition to the required reporting sources, physicians, health facilities and clinical laboratories, NYS has also pursued reporting by poison control centers. This has met with mixed success. A close relationship with the New York City Department of Health and Mental Hygiene allows the PPR to obtain a monthly upload of PCC data. This upload is performed using a secure file transfer utility in a secure network maintained by NYSDOH and in which both PPR and NYCDHMH have accounts. The Finger Lakes PCC also transmits pesticide poisoning reports quarterly using PDF files and a secure file transfer system.

Unfortunately, no other PCC is able to send reports this way. They have an ability to send reports as e-mail attachments, but this violates DOH security policy; e-mail messages are not secure and may pass through many internet servers in route.

In this aspect of the grant, the funds enabled NYS to 'combat' under-reporting by targeting specific provider populations and exploring new sources of reports.

NYS implemented its pesticide reporting regulations in 1991. Software was developed to document reports and effort, however the initial software architecture was 'naïve'; pesticide reports turned out to be more complicated than its flat-file structure anticipated. When more than one person was affected by a pesticide application, details of the event narrative had to be entered in every record. Although this was fairly easy to do using 'cut & paste', it resulted in duplicate data that was difficult to maintain changes to the narrative were made. In addition there was no unique identifier for each person; persons with multiple exposures could not be easily matched (this is common for seasonally exposed lawn care workers).

In 1997, NYS began redesigning its software to accommodate multiple persons in the same event, and persons with multiple events. At the same time, NIOSH was developing a consistent set of core variables to be used by states receiving funding to report pesticide poisonings to a national database under the SENSOR program. NYS included compliance with the standard variables as part of the redesign. In 1999, NYS was asked to make the software available to other states, and the application was 'delocalized' and distributed through NIOSH. At that time the software received a new name, SPIDER, an acronym for SENSOR Pesticide Incident Data Entry and Reporting. SPIDER is a network ready, multi-user data entry application written in Microsoft Visual FoxPro, a fully relational database development environment. Data is validated against the NIOSH Standard variables definitions through both look-up tables and field validation procedures. It includes an export routine that removes identifiers before data is aggregated at NIOSH.

Through the SENSOR grant, NYS has updated the software annually with new pesticide products registered by EPA, and to accommodate new variables and changed core definitions. In 2005, SPIDER was upgraded to Microsoft Visual FoxPro 9.0.

Publications:

20023102 Mauer MP, Rosales R, Sievert J, et al. Surveillance for acute insecticide-related illness associated with mosquito-control efforts – nine states, 1999-2002. Morbidity and Mortality Weekly Report. 52(27); July 11, 2003.

20023570 Calvert GM, Mehler LN, Rosales R, Baum L, Thomsen C, Male D, Shafey O, Das R, Lackovic M, Arvizu E. Acute pesticide-related illnesses among working youths, 1988-1999. Am J Public Health 2003; 93:605-610.

20026095 Calvert GM, Plate DK, Das R, Rosales R, Shafey O, Thomsen C, Male D, Beckman J, Arvizu E, Lackovic M. Acute occupational pesticide-related illness in the US, 1998-1999: surveillance findings from the SENSOR-pesticides program. Am J Ind Med 2004;45:14-23.

20027916 Alarcon WA, Calvert GM, Blondell JM, Mehler LN, Sievert J, Propeck M, Tibbetts DS, Becker A, Lackovic M, Soileau SB, Das R, Beckman J, Male DP, Thomsen CL, Stanbury M. Acute illnesses associated with pesticide exposures at schools. JAMA 2005; 294: 455-565

Petersen AM, Calvert GM, Sievert J, Mehler L, Das R, Harter L, Romoli C, Becker A, Ball C, Male D, Schwartz A, Acute Pesticide Poisoning in US Retail Industry, 1998-2002, Journal of Environmental and Occupational Medicine, (Submitted, August 2005)

20028817 NIOSH [2005] Pesticide-Related Illness and Injury Surveillance, A How-to Guide for State Based Programs, NIOSH Publication Number 2006-102.