

Response to Pre-notification of Pesticide Application in a Public School System

Amy E. Brown, Department of Entomology, University of Maryland, College Park, MD 20742 (ab35@umail.umd.edu)

Jacob Z. Schmidt, Maryland School of Public Affairs, University of Maryland, College Park, MD 20742

Abstract

Response to Pre-notification of Pesticide Application in a Public School System

Amy E. Brown, Department of Entomology, University of Maryland, College Park, MD 20742

Jacob Z. Schmidt, Maryland School of Public Affairs, University of Maryland, College Park, MD 20742

This paper reports on a survey of parents and staff responses to the pesticide pre-notification program implemented in a Maryland county school system. The majority of parents and staff were satisfied with the amount, type, and timing of information provided in the pilot program. Less than 1% of staff and just 2% of parents stayed home or kept children home from school. Less than 5% of respondents believed they or their children had exhibited symptoms of pesticide illness from the school pesticide applications, although less than a third of parents and only 14% of staff reported watching for symptoms.

Keywords: IPM schools pesticide safety health youth

INTRODUCTION

In recent years, and especially following passage of the Food Quality Protection Act of 1996, public attention has focused on children's exposure to pesticides. Because children spend a large percentage of their time in school, the possibility of exposure to pesticides in that setting is being scrutinized. Data on the extent of children's exposure to pesticides from school applications are lacking. The U.S. General Accounting Office report on November 1999, which reviewed the use of pesticides in schools called attention to the general lack of dependable data on school exposures and illnesses possibly

linked to such exposures. Both mandatory and voluntary programs designed to reduce children's exposure to pesticides while in school have been instituted or are under consideration by many school systems across the country. In Maryland, the Anne Arundel County public schools (AACPS) system has implemented IPM since 1989; in January 1997, AACPS voluntarily instituted a pilot pre-notification program for pesticides (Appendix A). In the spring of 1999, the University of Maryland Pesticide Education and Assessment Program, in cooperation with AACPS, conducted a survey of parents and staff responses to the pre-notification program. The

study had three objectives: 1.) to characterize the responses of parents and staff to pre-notification of pesticide applications, 2.) to investigate whether children and/or staff reported being made ill from pesticide exposures occurring in the schools, and 3.) to determine the level of satisfaction with the information provided for pre-notification.

METHODOLOGY

Schools that had received at least one pesticide application requiring pre-notification within the past two school years were identified for participation in the survey. Questionnaires were developed to investigate parents (Appendix B) and staff (Appendix C) responses to notification of pesticide applications. The forms were sent to the AACPS Environmental Program Manager, who sent them to individual schools for further distribution. Teachers distributed a copy of the parents' questionnaire to each of approximately 73,000 students to take home. Parents were asked to complete only one form for each household, regardless of the number of children in the school system, and to return the survey within two weeks, either by sending it back to the school with their child, or by mailing it to the address on the front of the questionnaire. Teachers collected the returned forms and sent them back to the Environmental Programs Manager to be mailed back to the researchers. For the staff survey,

questionnaires were distributed to approximately 8,000 staff in their office mail. Staff returned them through the same process, *i.e.*, the Environmental Manager mailed the collected surveys back to the researchers.

RESULTS

Frequencies were calculated for answers to all questions. In addition, chi-square analyses were performed to investigate (a) effects of school level/sex of child on remembrance of notification, on response to notification, on desire to receive information/notification, and on type/amount of information desired; and (b) effect of age class/job category on remembrance of notification, on response to notification, on desire to receive information/notification, and on type/amount of information desired. In case (a), the chi-square analyses were based on responses from parents with only one child in the school system. For both staff and parent returns, not all questions were answered by each respondent; this is evident in the frequencies reported below. Only those comparisons which were significant (p less than or equal to 0.05) and based on a reasonable amount of data (less than 10% of respondents not answering) are reported. When the respondent had a choice of answering "yes" or "no", it can be argued that a non-response most likely represents a "no." However, the data herein reported were interpreted conservatively; *i.e.*,

missing responses were not included with "no" responses. Likewise, non-responses where the questionnaire offered a choice of possible answers (*e.g.*, what actions they took in response to notification), were not included with "no" responses. Rather, in each case, they were treated as missing data.

Demographics

Parents returned 4,265 forms. Male and female children were roughly equally represented in the returned forms (48% and 52%, respectively), with 60% in elementary school, 18% in middle schools, and 22% in high schools. Assuming the average number of children per household (1.8) of responding parents was not different from the number of children per household in the Anne Arundel county schools overall, the response rate for parents was 10%.

Staff returned 937 forms, a return rate of 12%. Sixty-nine percent of staff respondents were teachers, 6% held administrative positions, 1% were custodians, 16% reported their job category as "other," and 8% did not respond to this question. Approximately one-third of staff respondents were in each of the age categories 40-49 and 50-59; 13% were ages 20-29, and 15% ages 30-39.

Remembrance of Receiving Notification

Forty-seven percent of parents and 68% of staff remembered receiving pre-notification of a pesticide application at least once during the previous school year. Half (51%) of parents and 30% of staff reported that they did not remember receiving any pre-notification during that period. Non-respondents totaled 2% for both parents and staff. No effects were found to be associated with a particular school or schools.

Parents of girls were slightly more likely to remember receiving notification than parents of boys (Table 1). This difference was small, but statistically significant. One percent of the respondents with only one child in AACPS schools (and thus counted in the data set for this question) failed to answer the question.

Remembrance also increased with the school level of the child (Table 2). A greater proportion of parents of middle school children remembered receiving notification than parents of elementary school children, and a greater proportion of parents of high school children remembered than parents of middle school children. Three percent of parents with only one child in AACPS schools, and thus included in the data set for that question, failed to answer the question.

Table 1. Effect of gender of child on parents' remembrance of receiving notification.

	Percent remembering notification	Percent not remembering notification
Parents of a male child	40.2	59.8
Parents of a female child	46.0	54.0

$p = 0.020$

Table 2. Effect of age of child on remembrance of receiving notification.

	Remembered	Did not remember
Parents of elementary school children	39.9	60.1
Parents of middle school children	43.6	56.4
Parents of high school children	58.8	41.2

$p = 0.001$

For staff, administrators recalled receiving pre-notification more often than teachers ($p = 0.04$). The number of custodians responding (8) was too low to make a valid comparison.

Actions Taken in Response to Notification

After receiving pre-notification, slightly more than half of the parents responding did not seek further information, did not take their children to the doctor, and did not keep children home from school (Table 3). Those who did seek further information, took their children to the doctor, or kept children home from school represented just 1-2% of the respondents in each case. Of the two percent of parents who did seek outside information ($n = 103$), 50 reported contacting a

physician, allergist, or pediatrician; 15 sought information from a friend, 10 contacted school officials, six contacted a local, state, or federal government representative, five sought the advice of the school nurse, four used the Internet to search for information, four contacted pest control services, and four contacted the Poison Control Center. Only approximately one-quarter of parents responding watched their children for possible symptoms.

Table 3. Percentage of parents taking action in response to notification

	Yes	No	No response
Sought further information	2.5	52.4	45.1
Watched child for possible symptoms	25.7	31.8	42.5
Kept child home from school	1.6	55.6	42.8
Took child to a doctor	1.5	53.4	45.1

For staff, almost three-quarters did not seek further information, did not visit a doctor, and did not stay home from work (Table 4). Of staff who reported seeking further information (n = 9), three people contacted a physician, three

contacted school officials, one contacted the school nurse, and one contacted a pest control service. Only about 14% of staff responding watched for possible symptoms.

Table 4. Percentage of staff taking action in response to notification

	Yes	No	No response
Sought further information	1.0	71.8	27.2
Watched for possible symptoms	13.7	59.9	26.5
Stayed home from work	0.5	73.3	26.1
Went to a doctor	0.7	72.3	27.0

Possible Associations Between Pesticide Application and Illness Symptoms

Three percent of parents responding believed they had noticed symptoms associated with pesticide application in the school; 87% reported they had not, and 11% did not respond to the question. Seven of the 114 parents who returned a positive response to this question nevertheless commented that they thought the symptoms might also

be due to some other cause, and not to pesticides. Of the parents who thought there was an association, 35 said a medical professional had diagnosed the association, while 66 said no medical professional had made such a diagnosis; 17 did not respond to this question. Parents reported 38 students in elementary school, 11 in middle school, and 19 in high school had shown symptoms, with 35 boys and 25 girls affected. Due to the low

numbers reporting positively on this question, chi-square analysis of cross-comparisons was considered invalid.

Four percent of staff members reported symptom(s) they believed associated with a pesticide application in the school; 91% did not associate any symptoms with an exposure, and 5% failed to respond to the question. Of the 37 individuals who believed they had experienced pesticide-related symptoms, 7 had received a medical diagnosis and 22 had not; 8 did not answer this question.

Symptoms noted by parents included general respiratory complaints (8 respondents), headache (7), rash (5), asthma (5), and one case each of vomiting, burning eyes, and throat/ear complaints. Staff reported headache (3), and general respiratory complaints (2), one nosebleed, and one case of skin/eye irritation.

Because the numbers of children and staff reported to have shown symptoms and/or a medical diagnosis of association with a pesticide application were so small, significance of age (school level of the child), child's gender, or staff's job classification could not be addressed in this paper.

Satisfaction with Timing, Type, and Amount of Information Received

Eighty percent of parents and 72%

of staff responding reported that they would prefer to receive information about the school's pest control program at the beginning of the year as well as notification each time a pesticide is applied (*i.e.*, as it had been provided under the AACPS voluntary program). Fourteen percent of parents and 17% of staff wanted information only at the beginning of the year, while 4% of parents and 7% of staff would prefer not to receive any such information or notification. Three percent of parents and 4% of staff did not answer this question. Parents of high school children were significantly more likely ($p = 0.001$) to want information only at the beginning of the year, with no notification for each application, when compared to parents of children in elementary or middle school.

Fifty percent of parents and 64% of staff felt the amount and type of information on the notification forms was just right. Thirty-two percent of parents and 18% of staff felt it was not enough. Non-respondents for this question totaled 19% of parents and 12% of staff. Of the respondents, 25% of parents and 26% of staff cited the type of pesticide, type of application, and more information on possible effects as information they would like to have added. Just two percent of parents and seven percent of staff felt too much information was provided.

Staff Assessment of Possible Problems Associated with School Posting/Notification

Thirty percent of staff responding reported they had noticed the signs posted at treated areas when pesticide applications were made in the schools; 67% had not noticed any such signs, and 3% did not answer the question. Twenty-four percent reported they had avoided the areas where signs had been posted; 40% did not avoid those areas; and 37% returned no response. Less than 1% of staff reported having seen unauthorized people removing the signs posted at treated areas. Sixty-nine percent had not witnessed any unauthorized removals. Thirty percent did not respond to the question.

Of those who had witnessed unauthorized removal ($n = 8$), four reported the signs had been removed by schoolchildren, one by a staff member, and one by a teacher, and 2 did not identify who had removed the sign(s). Only one staff member reported having personally applied a pesticide product in the building (cafeteria) within the past year. It could not be determined through the survey whether the individual's responsibilities included pesticide application.

Fifteen percent of staff members ($n=142$) said they had experienced problems with the written notices given to the students (75% had not, and 10% did not answer the

question); 136 individuals (not necessarily the same individuals who answered the question positively) wrote comments in answer to this question. Of those, 116 said students often discarded the notices, used them for notes, and/or left them at school.

DISCUSSION AND CONCLUSIONS

The low survey response rate was an expected outcome for a survey of this type. Due to confidentiality concerns, the investigators were unable to identify those who had not returned survey questionnaires in order to perform usual follow-up procedures. While the data thus cannot be relied upon to be characteristic of responses of the entire possible population of parents and staff in the Anne Arundel County school system, they do provide very interesting information for future studies to investigate more fully. Rather than attaching too much importance to the actual percentages derived, the reader is urged to view the data qualitatively.

Schools chosen for the study included only those for which pesticide pre-notification had been sent out within the past two school years, yet only about half of the parents and about two-thirds of the staff remembered receiving any notifications. This may be due to several factors. The time period involved during which notifications took place may have been too long for some individuals to remember.

For parents, perhaps the most likely factor may be that children were not giving the notices to their parents, as over 100 staff members wrote. The trend for increasing recall with the increase in the child's school level may indicate that older children are more conscientious about giving notices to their parents. Another important factor is that individuals may have lesser recall of things they do not perceive as important, and this may have affected the memory of those who did not have a concern about pesticide applications in the school.

The AACPS program provided general information about pest control and IPM programs in the schools at the beginning of each year, and a notification prior to each pesticide application throughout the school year. Overall, parents and staff who responded to this survey were satisfied with both the timing and the amount/type of information supplied. Receiving general information about the pest control program at the beginning of the year, combined with pre-notification of applications each time they were scheduled was the preferred combination, and respondents wanted to continue to receive information similar to the type provided by AACPS. The fact that parents of high school students were more likely than other parents to want information only at the beginning of the year and did not want to be notified

each time prior to a pesticide application may indicate that these parents have watched their children grow up without any evidence of pesticide illness from school applications. Parents of younger children may still be watching more closely for possible symptoms and are not yet assured that their children will not experience adverse effects from these applications. While 32% of parents and 18% of staff wanted to receive more information than what was provided by the AACPS program, only a quarter of those respondents were able to identify what type of information they felt was lacking, which included the type of pesticide, type of application, and more information on possible effects.

It is encouraging that only a very small number of respondents (either staff or parents) reported illnesses they thought linked to the pesticide applications. Children with a history of pesticide-associated illnesses (either perceived or real) may be more likely to give the notices to their parents, as they may have been taught to pay more attention to pesticide issues. Also, parents and staff who have a strong feeling about pesticides in schools (for instance, parents who believe their children have been adversely affected by the application of pesticides) may be more likely to complete and return the forms. Thus, the percentage of staff or parents who actually believe they

or their children have shown symptoms of overexposure from pesticides applied in the schools is less likely to be under-represented than persons who do not believe they or their children have shown such symptoms.

It should be noted that slightly less than a third of parents and an even smaller proportion of staff reported watching for possible symptoms. Parents who watch for symptoms in their children in the early years, and who do not associate any symptoms with the timing of pesticide application, may disregard notices in later years on the assumption that the children would have shown effects by that time if they were sensitive to pesticides. This study did identify a trend in that direction, but as the AACPS program had been in place only since 1997, this finding provides only weak support for the argument.

In any case, symptoms of overexposure to a pesticide may be mild such as a minor headache or skin irritation, or may be mistaken for symptoms of allergies or other illnesses, such as the flu. Conversely, such symptoms may actually be due to other, non-pesticide related factors. This study was not designed to investigate actual cases of illness related to pesticides applied in schools. Rather, it assessed perceptions of pesticide illness. Few of those who reported having seen symptoms had received a

medical diagnosis. With the exception of the cholinesterase assay, which is not reliable without baseline tests and is not generally appropriate for low-level exposures such as through school applications (Brown *et al.*, 1999), tests to detect overexposure to pesticides in humans are not available or are not generally appropriate. Pesticides and/or their metabolites can sometimes be identified through blood and urine tests, but these assays have not been calibrated to reflect levels of normal exposure vs. toxic levels of exposure." The medical professional must make a diagnosis on the basis of association in time and space, knowledge of the pesticide's toxicologic profile, consideration of other exposures or potential causative agents, and knowledge of the patient (Reigart and Roberts, 1999).

During the course of formal education for doctors, nurses, and other primary health care providers, little to no information on detecting and diagnosing illnesses from exposures to environmental agents is provided, and practicing health care providers may not know what resources exist in the field. Without proper training, some health professionals may miss cases of illness caused by pesticides or other environmental exposures, while others may over-attribute illnesses to this cause. School nurses, in particular, should

be educated about the possible signs and symptoms of overexposure to pesticides. They are often in the best position to detect early signs of overexposure in children. Aside from school exposures, which are likely to be quite small when schools practice cautious use of pesticides as part of an IPM program, children may be exposed to pesticides applied in their environment away from school. These may include exposures from pesticides applied on or to farms, homes or apartment complexes, lawns, landscapes, and play areas. Pesticide educators have encouraged pesticide applicators, handlers, and workers to be aware of possible pesticide-related symptoms; they can be instrumental in educating other groups of people who may be incidentally exposed, as well as the health care providers who treat them.

ACKNOWLEDGMENTS

The cooperation of the staff of Anne Arundel County schools in distributing, collecting, and returning the survey forms is gratefully acknowledged. Mr. Dan LaHart, Environmental Programs Manager for Anne Arundel County Schools, volunteered the program for participation, provided background information on the AACPS program, and saw that the forms were copied and distributed appropriately. In addition, the authors thank the parents and staff who completed and returned

survey forms. Data compilation and frequency calculations were performed by the Survey Research Center, University of Maryland. Mr. Daniel Denman, Manager of the University of Maryland Statistics Laboratory, conducted statistical analyses of comparisons of interest.

This study was partially supported with a grant from EPA Region III., administered through the Maryland Department of Agriculture. AACPS assumed the costs of copying and distributing surveys. Additional funding was provided by the Pesticide Education and Assessment Program, Department of Entomology, University of Maryland, College Park, MD.

REFERENCES

- Brown, A. E., M. Miller, and M. Kiefer. 1999. Cholinesterase monitoring -- A guide for the health professional. Pesticide Information Leaflet No. 30, Department of Entomology, U. Maryland, College Park, MD.
- Reigart, J. R., and J. R. Roberts. 1999. Recognition and management of pesticide poisoning, 5th Ed. U.S.E.P.A. www.epa.gov/pesticides/safety/healthcare.
- U.S. General Accounting Office. November 1999. Pesticides: Use, effects, and alternatives to pesticides in schools.

APPENDIX A

AACPS Pilot Program Description

Under the AACPS pilot program, at the beginning of each school year students received "Making the Home-School Connection," a pamphlet outlining the school system's policies on smoking, dress code, pest control, etc. Under the section, Health and Welfare of Students, the pamphlet explains that IPM is implemented by the school system, and that parents would receive notification at least 24 hours in advance of any pesticide applications. Only Toxicity Category III pesticides -- those whose labels bear the signal word "Caution," indicating that the chemical is considered only slightly toxic to relatively nontoxic with regard to acute toxicity -- were used by AACPS. For the purposes of the pilot pre-notification program in AACPS, pesticides were defined as "insecticides, herbicides, rodenticides, and fungicides." Sanitizers, glue boards, baits, and zone monitors were not considered to be pesticides and thus did not require notification prior to use or application. The pilot program also called for AACPS to maintain Material Safety Data Sheets (MSDS) that could be accessed upon request. (MSDS provide technical summaries of each pesticide's physical and chemical properties as well as information on hazards and first aid.) In addition, schools in the system posted outdoor treated areas; indoor treatments did not require posting under the pilot program. When required, posting was done by the applicator 48 hours in advance of pesticide application.

Throughout the school year, the IPM staff inspected school property and grounds for pests. Based on the number, types, and location of pests detected, the staff determined when control measures were needed and whether a pesticide application was warranted. Effective non-pesticidal measures were considered in this process. Upon detection of a pest problem, the IPM staff member filled out a Work Order form identifying the nature of the work to be done to control the pest. Each Work Order calling for a pesticide application triggered the following notification procedure:

The Environmental Issues Program Manager in the Central Division of Maintenance and Operations sent a memo to the principal of the school that was identified as needing a pesticide treatment. Memos concerning structural applications were hand delivered to the schools by the IPM staff because these applications were made as soon as possible after discovery of the problem. For landscape or other outdoor applications, however, the memo was sent via the school mail distribution system, as more time was allowed between discovery of a problem and the application of a pesticide. The memo requested that the school provide copies of the attached notification(s) of upcoming pesticide application to all parents, teachers, and staff at the school. The memo also directed the school to keep a copy of the MSDS and sample label in its administrative offices and to make them available for review. The school copied the notice and distributed one to each student to take home to his/her parents. Notices were also placed in each school staff member's mailbox.

The notice provided the brand name of the pesticide, identified the location to be treated, stipulated the time period within which the application would be made, and, if an outdoor treatment was to be made, stated that the treated area would be posted at least 48 hours prior to application. In the case of indoor applications, a specific date was usually identified for the application. For outdoor pest problems, the actual application date usually was given as a range of soonest to latest expected dates of application, as outdoor treatments were dependent on weather conditions and other factors; thus, pinpointing the exact date would have been more complicated. Information on symptoms of acute exposure and medical conditions, which might be aggravated by exposure to the pesticide was also provided. All of this information was prepared by the school system's Environmental Issues Program Manager based on pesticide labels and MSDS. To help ensure compliance with the voluntary notification program, the Environmental Issues Program Manager reviewed the procedures annually at area-wide meetings of school staff. Administrative trainees were brought in once a year for orientation, which included both IPM and notification issues.

APPENDIX B

Questionnaire for Parents

The results of this survey will help other states who are considering developing notification programs. Please complete only one survey, regardless of the number of children you have in the Anne Arundel County public school system. We appreciate your participation.

1. What is the school level and sex of each of your children in the Anne Arundel school system?
 Child 1: male female ; elementary school middle school high school
 Child 2: male female ; elementary school middle school high school
 Child 3: male female ; elementary school middle school high school
 Others: _____

2. Do you remember receiving notification of pesticide application at any time during the current school year?
 no yes ; if yes, how many times did you receive notification? _____

3. After receiving notification of pesticide application, did you:
 Feel further steps were necessary? no yes ; if yes, sometimes or each time
 Take your child/children to the doctor? no yes ; if yes, sometimes or each time
 Seek information from outside sources? no yes ; if yes, what sources did you use?

 Keep child/children home from school? no yes ; if yes, sometimes or each time
 Watch for possible symptoms? no yes ; if yes, sometimes or each time
 Contact the school or school district? no yes ; if yes, sometimes or each time
 Contact someone for advice? no yes ; if yes, sometimes or each time
 If so, whom did you contact? _____

4. Do you believe you have noticed symptoms in your child that may have been associated with a pesticide application in the school? no yes
 If yes, what was the age level and sex of each child you believe was affected? _____
 Did a medical professional diagnose an association between the pesticide and the application? no yes

5. Next year, notification of pesticide application will be required in all Maryland public schools. Some parents in schools that do not already have such a program have expressed a strong desire for the program, while others have indicated they do not think a notification program is necessary. If you had the choice, would you prefer:
 to receive information about the school's pest control program at the beginning of the school year, but not notification each time a pesticide is applied.
 to receive information about the school's pest control program at the beginning of the school year, as well as notification each time a pesticide is applied.
 not to receive any such information or notification.

6. Do you think the amount and type of information on the notification(s) you are currently receiving are:
 just right.
 not enough; if so, what information would you like to see added?
 too much; if so, what information would you prefer left out? _____

If you have further comments please attach a sheet of paper to the inside of the survey.

Staple or tape the survey with this side on the inside and within two weeks return it to the school with your son or daughter.

