Messages from Monitoring

Farm Workers, Pesticides and the Need for Reform

Farm Worker Pesticide Project
Farmworker Justice Fund
United Farm Workers

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Farm Worker Pesticide Project
Together with farm workers and their families, FWPP works to reduce and eliminate their exposures to pesticides. To that end, FWPP: i) provides resources and information to farm workers and their advocates about pesticides, ii) unites diverse groups and individuals behind a joint strategy to address the farm worker pesticide problem, and iii) participates in that strategy as an advocate, organizer, educator and researcher. The organization leverages resources, including but not limited to financial, scientific, legal, educational and other resources, to help the farm worker community on pesticide issues and on other matters of social justice. For more information, contact: Carol Dansereau, FWPP, Room NB3, 5031 University Way NE, Seattle, WA 98105; 206-729-0498; cdansereauFWPP@earthlink.net

Farmworker Justice Fund
For twenty-three years, the Farmworker Justice Fund, Inc. ("FJF") has been helping empower migrant and seasonal farmworkers to improve their wages and working conditions, labor and immigration policy, health and safety, and access to justice. For more information contact: Shelley Davis, FJF, 101 Vermont Ave. NW, Suite 915, Washington, D.C. 20005, sdavis@nclr.org, 202-783-2628, Ext.202, www.fwjustice.org

United Farm Workers
Founded by Cesar Chavez, the United Farm Workers of America, AFL-CIO, represents over 20,000 farm workers throughout Washington, Oregon, California, Arizona and Florida. The UFW has been on the forefront of the fight for a safe, dignified workplace and living wages for the country's farm workers for over 30 years. In Washington, the UFW has offices in Sunnyside and Tacoma. For more information, contact Erik Nicholson, Pacific Northwest Regional Director, UFW, PO Box 8337, Tacoma, WA 98418, enicholson@ufwmail.com, 253-274-0416, www.ufw.org

This report is available on-line at www.fwjustice.org.

EXECUTIVE SUMMARY

Farm workers play a vital role in Washington State agriculture. Results of a new medical monitoring program and recent studies reveal the steep price these workers and their families pay as the result of the industry's reliance on highly toxic pesticides.

I. Medical Monitoring: Documenting Toxic Exposures and Their Consequences. After nearly 20 years of struggle and a state Supreme Court victory, state workers who regularly handle organophosphate (OP) and carbamate (CB) pesticides finally received medical monitoring in 2004. Blood tests were taken before the spray season to establish each worker's normal levels of cholinesterase, an essential enzyme in the nervous system which is inhibited by OPs and CBs. Follow-up blood tests were conducted during spray season. When cholinesterase levels declined by more than 20%, employers were required to do workplace safety audits to identify causes of exposure. When levels declined by 30% or more for one type of test (red blood cell) or 40% or more for a different test (plasma/serum), employers were required to remove workers from handling and other tasks with high exposures.

First Year Results: 1 in 5 workers with significant nervous system impacts. Over the course of the spray season, 123 (20.6%) pesticide handlers out of 580 who received both baseline and follow-up tests had depressions of more than 20%. Of these, 26 (4.4% of the 580 workers) had depressions low enough to trigger removal. Depression rates were even higher early in the spray season when one in four workers had action-level depressions and more than 6% needed to be removed. Serious depressions were likely undercounted because: 1) according to scientists who reviewed the program there is a high risk of "false negatives" (test results failing to identify actual significant depressions); 2) most baseline tests were run long after blood samples were taken; cholinesterase levels in these samples likely declined before the tests were run; and 3) some workers reportedly declined monitoring due to fear of retaliation by employers.

L&I's Inadequate Response. A major purpose of monitoring is to ensure swift audits and removals to prevent further exposures and injuries. Cholinesterase depressions can cause severe problems including nausea, neurological problems, seizures, respiratory distress, and even death. Nonetheless L&I decided to "offer" consultations to employers rather than to exercise its enforcement authority. This resulted in long delays between when agency consultation staff learned of depressions and when workplace visits took place. The average time between receiving the cholinesterase test results and inspecting the workplace was 34.5 days for workplaces requiring audits and 35 days for those where workers had to be removed. Often 7 or more weeks elapsed.

Causes of Depressions. Valuable information was collected through workplace visits.

1) Four pesticides were involved in the vast majority of workplaces where workers had serious depressions: chlorpyrifos (Lorsban), azinphos methyl (Guthion), carbaryl (Sevin), and formetanate (Carzol). Chlorpyrifos, in particular, had been handled at many worksites where serious depressions occurred.
2) In a large percentage of depression cases, there was no evidence of non-compliance with Worker Protection Standards. This points to a need for stronger regulations, including phase-outs of highly toxic pesticides. In approving registrations for pesticides, including azinphos methyl and chlorpyrifos, the U.S. Environmental

Protection Agency acknowledged that workers will experience unacceptable exposures even with the best available protective gear and engineering controls.

3) One common factor at workplaces with depressions was use of air-blast sprayers towed by tractors to apply pesticides. State and federal rules allow open cabs on these tractors, even though enclosed cabs effectively reduce pesticide exposure.
4) While site visits rarely identified specific probable causes of depressions, L&I consultants suggested measures that might help reduce exposures such as full-face respirators, on-site showers and changing areas, less bulky gloves for handlers, and increased enforcement and training.

II. Other Studies. A Fred Hutchinson Cancer Research Center study published in February of 2004 found OP residues in the urine of 9 out of 10 fieldworkers as well that of every handler. Other recent studies in the state document exposures not only for farm workers but also for their families through drift and through pesticides brought home on workers' skin, hair and clothing. While air monitoring is not done in Washington, air measurements taken in California show that high percentages of the general population in areas where chlorpyrifos and other pesticides are used inhale these at rates exceeding health guidelines set by EPA and the State of California. Researchers note that farm workers and their families are at even greater risk.

III. A Failure to Protect Workers and their Families. Even as evidence has mounted regarding the need to better protect workers and their families, the federal government has re-registered OPs and other highly toxic pesticides. It has failed to meaningfully promote alternatives, to require medical monitoring, or to adopt other measures to reduce exposures. Washington State government has also failed workers and their families:

1) **Failure to Promote Alternatives**. Using less toxic alternatives is the most effective way to prevent pesticide exposures. Alternatives such as mating disruption for tree fruit moths are already used by many growers. Studies have found that orchards which do not rely on OPs and CBs are more economically sustainable than those of conventional pesticide users. Increasingly consumers are demanding pesticide-free foods. Nonetheless Washington State has not set timelines for ending the use of highly toxic pesticides. Nor has it put meaningful resources into promoting alternatives.

2) **Undercutting Enforcement**. Washington State Department of Agriculture (WSDA) management has dramatically undercut agency enforcement staff in the last 18 months by i) adopting a restrictive "Right of Entry" policy that undermines the ability of inspectors to gain access to farms for inspections, ii) removing one of WSDA's most effective inspectors in response to pressure from the Farm Bureau, and iii) upholding an administrative law judge decision which makes enforcement in drift cases nearly impossible.

3) **Failing to Strengthen Regulations.** State agencies have not taken the initiative to require necessary measures to reduce exposures for farm workers and their families such as enclosed cabs for applicators, gloves for fieldworkers, on-site showers and changing areas, and restrictions on the use of air-blast equipment. Nor have they adopted new rules in response to farm workers' requests. In particular, they have

failed to i) require closed systems for mixing and loading of pesticides as petitioned by workers, and ii) adopt stronger regulations to prevent drift as requested by workers and others.

IV. Time for a New Direction. Medical monitoring and new studies have made visible the impacts of agricultural pesticide use on farm workers and their families. They have illuminated the toxic exposures routinely experienced by this community, an injustice and public health hazard which must no longer be ignored. It is time for a new vision of agriculture which protects workers and their families *and* provides long-term sustainability for growers. This new vision is also needed to address the concerns raised about farm worker pesticide issues by our neighbor and trading partner, Mexico.

A). We call upon Governor Gregoire to:

1) Establish a new program to end the use of the most dangerous pesticides, including OPs, CBs, carcinogens and other highly toxic pesticides. As part of this program, the Governor needs to set phase-out deadlines, provide funding for sustainable agriculture programs, and ensure worker involvement in decision-making processes.

2) Direct state agencies to take immediate steps to reduce exposures during transitions to alternatives:

a) Direct L&I to improve implementation of the medical monitoring program. Among other things, L&I must use its enforcement authorities rather than relying on consultations.

b) Direct WSDA to conduct effective enforcement by i)revising its right of entry policy to make it consistent with its statutory enforcement responsibility; ii) launching an independent review of the decision to remove WSDA inspector Dave Zamora from his enforcement position, iii) reversing its position with respect to the drift case, *In Re: David F. Bender*, and iv) providing air monitoring equipment to inspectors to improve enforcement related to drift.

c) Take immediate steps to strengthen regulations. These measures must not be a substitute for phasing out dangerous pesticides, but are important as interim protections. In particular i) direct L&I to propose rules mandating the use of closed systems for the mixing and loading of all liquid Category 1 and 2 pesticides in Washington State; ii) direct WSDA to adopt rules establishing no-spray buffer zones around unprotected workers, their homes, and schools, and to otherwise reduce pesticide drift; and iii) direct L&I to adopt rules mandating enclosed cabs for applications of highly toxic pesticides, gloves for fieldworkers, full-face respirators for handlers, showers and changing areas at workplaces, and other protections.

B) We call upon President Bush to: i) cancel registrations for azinphos methyl, chlorpyrifos and other highly toxic OPs and CBs; ii) require cholinesterase monitoring on a national basis, and iii) otherwise act to protect workers and their families and reduce reliance on highly toxic pesticides.

Introduction

Each year more than 100,000 migrant and seasonal farm workers plant, nurture, harvest and pack apples, potatoes and other crops in Washington State.[1] Their work supports one of the region's most important industries and puts food on the table for people in Washington State and beyond.

But workers and their families pay an unacceptable price for the important work they do. As we enter 2005, we have in hand results of a new medical monitoring program implemented for the first time in 2004 in Washington State. Workers who regularly handle neurotoxic pesticides were monitored for the nervous system effects of pesticide exposures. We also have in hand findings from an array of recent studies of both workers and their families conducted in Washington State.

The results from the monitoring program and these studies are cause for great concern. They make visible the significant toxic exposures routinely experienced by the farm worker community, an injustice and public health problem which must no longer be ignored.

This report provides an overview of the medical monitoring program's first year results and of recent studies in Washington State. It outlines inadequacies in state and federal responses to date on this issue, and calls upon Governor Gregoire and President Bush for the leadership and vision to protect workers and their families, and in so doing, agriculture.

I. Medical Monitoring: Documenting Toxic Exposures and Their Consequences

Background On February 1, 2004 medical monitoring of farm workers who regularly handle pesticides began at last in Washington State. While monitoring had been in place in California since 1974, it took nearly 20 years of effort on the part of workers and a state Supreme Court decision in their favor to establish the program in Washington.

In its first year, the medical monitoring program applied to all workers who mixed, loaded, applied, or otherwise handled highly toxic organophosphate (OP) or carbamate (CB) pesticides 50 or more hours per month. Employers were required to arrange for these workers to receive "baseline" blood tests prior to the spray season to identify the normal levels of cholinesterase, an essential enzyme, in their bodies. Blood levels of cholinesterase parallel less-easily measured levels of it in the nervous system where it plays a critical role in controlling nerve impulses. OP and CB pesticides, such as azinphos methyl (Guthion) and carbaryl (Sevin), depress levels of cholinesterase in the body. When levels decline, workers can suffer serious health effects such as nausea, headaches, fatigue, and seizures. When levels are low enough, they can face more severe effects including long-term memory loss, paralysis and death.

Workers in the program were entitled to receive monthly follow-up tests when they met or exceeded the 50 hour per month handling threshold. (That threshold drops to 30 hours per month in 2005.) Under the monitoring rules, when cholinesterase levels decline by more than 20% from the workers' baseline level, employers are required to conduct workplace audits to identify and address factors contributing to serious depression. When levels decline by 30% or more for one type of blood test (red blood cell) or 40% or more for a different type of test (plasma/serum), workers must be removed from handling tasks to prevent any additional exposure, until their cholinesterase levels rebound sufficiently. Employers can assign removed workers to other tasks that do not involve significant exposures, if available. In any case, employers must maintain full salaries and benefits for removed workers.

To oversee implementation of the monitoring program in its first year, L&I established two advisory committees: a Stakeholder Advisory Committee and a Scientific Advisory Committee. The latter was composed of scientists nominated by different stakeholder groups.

First Year Results: **1 in 5 With Significant Nervous System Impacts**

In calling for medical monitoring all those years, workers argued that this basic protection would shed light on the exposures that handlers experience. They predicted that monitoring would find that large numbers of workers are exposed to organophosphates at levels that significantly interfere with their nervous systems by inhibiting cholinesterase. Some grower organizations opposed monitoring, maintaining that it would be a waste of time and money.

Unfortunately, the predictions of workers and the need for the monitoring program have been proven true by the results in 2004. Over the course of the spray season, 123 (20.6%) pesticide handlers out of 580 who received both baseline and follow-up tests had depressions of more than 20% (the workplace audit level).[2] Of these 26 (4.4% of the 580 workers) had depressions low enough to trigger removal under the state rules. Rates of depression were even higher for the first part of the spray season, with 82 (24.85%) of 330 workers having depressions of more than 20% as of May 12th of which 20 (6.06%) required removals. [3]

As disturbing as the depression rates are for the first year of the medical monitoring program, they may not fully reflect actual depressions. Factors that may have led to undercounting of depressions include the following[4]:

1) The risks of false negatives are high according to statistical analyses done by the Scientific Advisory Committee. The Committee's (draft) report discusses at length the potential for false negatives (missing depressions) and false positives (mistakenly finding that there is a depression), particularly with respect to serum tests. The draft report notes, for example, that "Based on the data presented, it appears that the serum ChE [cholinesterase] test is quite likely to correctly identify pesticide handler (sic) with real depression in serum ChE. A value that is 20% depressed from baseline has a greater than 94% probability of being depressed due to an actual change in the activity of the enzyme…. The obverse of this is that with the threshold set at 20% depression to trigger action, a pesticide handler with true 20% depression has only a 50% chance of being identified as depressed. *This means that half of the pesticide handlers with 20% true enzymatic depression will be classified as not having depression*." (emphasis added)[5]

2) Most baseline blood samples were run long after the blood samples were collected. About 91% of the baseline samples were processed beyond the two day expected period because the numbers of samples submitted vastly exceeded what was anticipated and because of adjustments that had to be made to lab equipment in February.[6] Cholinesterase levels in blood drop when samples are stored for long periods of time.[7] Thus, when follow-up samples were done for these workers, significant depressions may have been missed.

3) Workers reportedly declined monitoring due to actual or perceived employer interference. L&I did little to check on compliance at worksites where blood tests were not submitted. It did little to investigate whether workers were pressured by employers or others to opt out of the monitoring program. The draft Scientific Committee report includes information from a survey of medical providers which indicates that there were problems related to this topic. According to the report, patient (worker) compliance was mentioned as an obstacle to monitoring by four (23.5%) of medical providers. Specific comments included: "We have patients who refused testing despite the fact that they received adequate instructions about the significance of testing. We realized that in some cases patients were afraid of abnormal results that would cause them to lose their jobs." [8] Elsewhere the report notes that 10 of 15 surveyed medical providers reported that some patients declined to participate. "Employees declined due to perceived employer pressure, fear of needles or having a blood sample drawn, and fear of retribution if the level was abnormal."[9] Workplaces in which workers were afraid to exercise their right to be monitored may well be ones in which there is a general lack of caution which could increase exposures.

In short, a high percentage of handlers who underwent baseline and follow-up testing experienced serious declines in cholinesterase after handling pesticides known for their cholinesterase-inhibiting qualities. These results are a call to action. The state must immediately move to better protect workers from these pesticides.

L&I's Consultation Approach: Tardy and Ineffective. A major purpose of the medical monitoring program is to provide workplace audits and removals swiftly for workers with depressions to prevent any further exposures and injuries. Given the cholinesterase declines these workers have already experienced, additional exposures could put them over the edge into serious and potentially irreversible health problems such as muscle weakness, neurological impairment, seizures, respiratory problems, and even death. Despite this purpose, L&I chose not to use its enforcement authorities to investigate workplaces where depressions occurred. Even in cases where multiple workers had depressions, the agency adopted a "consultation" approach. Agency WISHA (Washington Industrial Safety and Health Act) staff placed phone calls to employers of workers with depressions to "offer" them voluntary consultations. Because L&I had to wait for an employer to agree to a visit, this approach resulted in long delays before workplaces were inspected. The average time between notification of WISHA staff and the workplace consultations was 34.5 days for workplaces where audits were required and 35 days where removals were required.[10] These numbers were averages. Much longer delays occurred for some workplaces. From an L&I log sheet obtained in June of 2004, it is clear that often 7 or more weeks elapsed between WISHA staff receiving notification of worker depressions and their visits to the workplace.[11]

These delays occurred on top of other delays including an average of 7.2 and 7.8 days between when Labor & Industries Policy and Technical Services staff learned of depressions warranting workplace audits and worker removals respectively, and when they informed WISHA staff. In short, workers in our state experienced serious depressions of an essential enzyme in their nervous systems for weeks or even months, risking severe health effects from additional exposures, without actions on the part of Labor & Industries to protect them. This outcome is a direct result of L&I's decision to offer consultations rather than exercise its enforcement responsibility to ensure safety.

Reliance on consultations also impaired L&I's ability to collect information needed to evaluate causes of depression. Consultants have less authority to obtain information from employers than inspectors do because consultations only cover matters for which employers voluntarily request assistance.[12] Moreover, public access to information obtained through consultations has been limited, thereby making it harder for community members, scientists, policymakers and others to evaluate the data and discuss its implications. Citing a new legal precedent (Building Industry of Washington et al v. LNI, Docket Number 30248-9-11; 10/05/04) L&I has now become even less willing to share data from the consultations than it had been in the past.

L&I failed in other ways to gather the information needed to protect workers and evaluate the monitoring program in 2004. In comments submitted to L&I in 2003 regarding draft rules for the program, farm worker advocates urged the agency to require employers to record and submit data pertaining to hours worked, handling activities, whether closed systems were used for mixing and loading, and other items.[13] Farm worker advocates renewed and expanded calls for thorough information collection during 2004 as the program was implemented. L&I did not produce mandatory reporting forms, however. Nor did it systematically request important data during workplace visits. Through legislation passed in the spring of 2004, employers of workers receiving medical monitoring were required to report handling hours for each worker to L&I. As of January 13th, 2005, L&I still had handling hours data for only

77.3% of the work removal cases, 50.1% of the workplace audit cases, and 69.5% of the tests overall, however.[14]

Causes of the Depressions. Although information-gathering opportunities were lost in 2004, the monitoring program nonetheless provided crucial data bearing on workplace conditions and hazards for farm workers. Three sources of information are particularly useful in beginning to discern conditions at workplaces that may be associated with depressions: 1) 19 case summaries provided to stakeholders by L&I on October 14, 2004[15], 2) an analysis done by the Scientific Advisory Committee, [16] and 3) a report to the legislature prepared by the Department of Labor & Industries.[17] These provide important insights including the following:

1) Four pesticides were repeatedly reported as having been used at sites where serious depressions occurred: chlorpyrifos (Lorsban), azinphos methyl (Guthion), carbaryl (Sevin) and formetanate (Carzol). The greatest proportion of handlers qualifying for workplace audits had been using only 1 insecticide, carbaryl or chlorpyrifos, with a significant but lower proportion using mixtures. The greatest proportion of handlers needing removal used a mixture of carbaryl and an OP insecticide (chlorpyrifos or azinphos methyl). [18]

Number of handlers with depressions requiring workplace audits and associated pesticide use (n=51 interviews) *Source: ChE Report: draft 11/10/04, Scientific Advisory Committee, p. 37 (* * Total is more than 51 because some handlers had both RBC and serum depressions of 20% or more.)

Pesticide	Red Blood Cell	Serum (Plasma)	Total Use	Percent of Interviewees
Carbaryl or carbaryl + formetanate	5	17	22	43.1
Chlorpyrifos alone	4	10	14	27.5
Carbaryl + OP	4	8	12	23.5
Chlorpyrifos + Other OP or formetenate	1	6	7	13.7
Azinphos methyl	1	0	1	2.0
Diazinon	0	1	1	2.0
Total Responses	15	42	57*	

From the chart above, it is apparent that chlorpyrifos was involved in at least 41.2% of the cases (27.5% where it was the sole pesticide used plus 13.7% where it was used in conjunction with another OP or formetanate). It is unclear whether chloryprifos may also have been involved in any of the "Carbaryl + OP" cases, raising the percentage of chlorpyrifos-associated cases even higher. Citing limits on public access to information obtained through consultations, L&I has refused to share additional data that would help answer this question. It has also not been possible to learn how many times azinphos methyl appeared in the "carbaryl + OP" and "chlorypyrifos + other OP or formetenate" categories.

2) One common factor at workplaces with depressions was the use of air-blast sprayers towed by tractors to apply the pesticides.[19] Air-blast sprayers have a pump

which delivers spray into an air stream created by a large fan at the back of the spray equipment. Applicators come in contact with pesticides that drift onto them as they operate this equipment. While enclosed cabs for tractors can substantially reduce worker exposures and state and federal rules have standards for effective protection from cabs, neither Washington nor federal rules require enclosed cabs for pesticide application.[20]

3) In a large percentage of the serious depression cases, there was no evidence of non-compliance with Worker Protection Standards or pesticide labels. Ten of the 19 case summaries expressly state that no deficiencies in compliance were identified. While not including that express statement other case summaries also may have been ones in which no violations were identified. Many of the summaries noted that growers and their employees exceeded regulatory requirements by wearing a respirator for chlorpyrifos though this is not required.

While acknowledging the absence of evidence of violations, some grower organizations conclude that workers must be doing something to increase their exposures. For example, Kirk Mayer of the Washington Growers Clearing House Association stated in comments to L&I on December 1st that "The consultation reports that I have seen show that in all cases the employer 1) met WPS requirements, 2) had appropriate safety programs in place and 3) provided more PPE than required. In recognizing that it is appears (sic) obvious that something(s) are not being stressed enough in training/education and that employees most likely have some sort of habit etc. that they are not aware of that contributes to an increased potential for exposure."[21]

These sorts of conclusions overlook a more logical and compelling explanation for the high rates of cholinesterase depression: the pesticides that workers are handling are extremely dangerous and existing regulations do not adequately protect them from these pesticides. In fact, citing cost-benefit provisions in federal pesticide registration law, EPA has approved continued use of some highly toxic OPs while openly acknowledging that even with full PPE and engineering controls, workers will experience exposures which EPA considers unacceptable, i.e. having Margins of Exposure (MOE) less than 100.[22] Almost all handling scenarios for azinphos methyl pose exposure risks for workers which EPA considers unacceptable, and numerous scenarios for chlorpyrifos do the same.

4). L&I consultants suggested measures that might help reduce exposures including, for example:[23]

a) The use of full-face respirators. Powered-air purifying type respirators (helmet, hood, or full-face) would provide greater protection than simple full-face respirators, they said. According to consultation reports, many workers wore half-face respirators while handling chlorpyrifos which left skin above and around the respirators open to contamination. As noted above, workers were not required by law to use any respirators at all for chlorpyrifos.

b) Encouraging on-site showers and changing areas for workers. L&I staff referred to workers going home without having showered or changed out of clothes worn at work as a problem in several summaries.

c) Requiring that employers provide gloves for handlers which are chemically protective but not too bulky for tasks such as unplugging applicator nozzles. Two summaries

referred to workers having to remove bulky gloves in order to deal with nozzle plug problems.

d) Stepping up enforcement and improving training on proper respirator storage, on stocking decontamination/emergency facilities, on locating these appropriately, and on ensuring that handlers have needed personal emergency supplies (e.g., eyewash water for those who need it.) Problems with decontamination facilities noted in case summaries echo those found in recent WSDA compliance overviews. In the most recent WPS Compliance summary document accessible to the public, the agency noted that many employers "are failing to provide decontamination supplies for pesticide handlers, especially at mixing and loading sites."[24] The monitoring case summaries combined with the WSDA data highlight the need for increased enforcement in order to achieve higher levels of compliance.

II. Other Toxic Findings

The medical monitoring results are not the only evidence of dangerous toxic exposures among farm workers in Washington State. Numerous studies by research institutions and state agencies provide ample additional evidence that not only workers, but also their families are regularly exposed to dangerous pesticides at high levels.

The Fred Hutchison Study: It's Not Just Pesticide Handlers

In February of 2004, scientists at the Fred Hutchinson Cancer Research Center published new findings based on urine tests of over 200 workers in the Yakima Valley.[25] The study documented that other workers, in addition to handlers, are regularly exposed to organophosphates. All of the handlers had OP break down products (metabolites) in their urine, but so did 9 out of 10 workers in most other job task categories. 94% of thinners (workers who remove small buds from tree limbs to increase fruit size) had DMTP, an OP metabolite, in their urine. For harvesters the percentage was 93.3%.

This evidence of exposure should come as no surprise, as in approving azinphos methyl and other OPs for re-registration, the U.S. Environmental Protection Agency authorized worker reentry to treated fields when risk levels vastly exceeded those considered acceptable by the agency. In fact, for azinphos methyl, as one example, workers can be in treated apple orchards for 13 weeks before residue levels decline to those EPA considers acceptable.[26]

The Fred Hutchison study and EPA's re-registration call into question the decision to only require monitoring for pesticide handlers. Further questions are raised by a study of peach harvesters working in azinphos methyl-treated orchards in California which was published in 1994.[27] The *median* cholinesterase depression for the harvesters over the 6 week season was 19% (a level close to the 20% level that requires a workplace safety audit under the Washington monitoring program). It is important to note that these workers did not enter the fields until *30 days* after applications. That REI was much more protective than the federal 14 day Restricted Entry Interval (REI) which is currently in place in Washington State for hand thinning and harvesting of tree crops after azinphos methyl applications.

Other Studies: Workers *and Their Children* Are Exposed

Examples of findings from other Washington State studies include the following:

- 96% of 571 surveyed workers in the Yakima Valley said that they had been exposed to pesticides at work.[28]
- Three quarters of farm workers in focus groups convened by the state Department of Health in 2002 recounted episodes of pesticide-induced illness at work.[29]
- Azinphos methyl was found in 85% of the house dust samples from 218 farm worker homes and 87% of the dust samples from workers' vehicles. Malathion, chlorpyrifos, phosmet, parathion and diazinon were also present in significant percentages of dust samples.[30]
- Of 211 farm worker children tested, 88% had organophosphate metabolites in their urine.[31]
- OP metabolites were found in 47% of the urine samples of young children living in 48 pesticide applicators' households.[32]

- Chlorpyrifos was found in house dust in all 61 applicator and farm worker homes and on the hands of 11% of their children.[33]
- Azinphos methyl, chlorpyrifos, parathion and phosmet were all found in 62% of the house dust samples from 59 farmers and farm workers homes. Two thirds of the homes contained at least one of the pesticides in concentrations above 1000 ng/g.[34]
- Researchers estimated "doses" of azinphos methyl received by 91 farm worker children based on the levels of metabolites in their urine. They found that 56% of the estimated doses exceeded what EPA considers acceptable in terms of risks of chronic (delayed) health effects. Thirty-five percent of the doses exceeded what EPA considers acceptable in terms of risks of immediate (acute) health effects. The researchers also estimated doses of the OP phosmet based on urinary metabolites. They found that nearly 9% of the phosmet doses exceeded EPA's acceptable dose for chronic health effects and 6% exceeded its acceptable dose for acute effects.[35]

These and other studies establish that children are exposed both through drift from nearby farmlands and through pesticides brought home on workers' skin, hair and clothing. While measurements have not been taken, children are also undoubtedly exposed before birth when mothers are exposed at work or home.

Air Monitoring in California. Pesticides are monitored in the air in agricultural areas in California. Government scientists there have determined pesticide inhalation rates for people living near the monitors. For various pesticides these rates exceed health guidelines for a high percentage of the general population. For example, more than half the people in areas where the pesticide metam sodium is used are breathing a chemical it breaks down into ("MITC") at rates that exceed health guidelines for protecting the respiratory system. More than half the children in areas near where chlorpyrifos is used are breathing it at rates higher than health guidelines for protecting their nervous systems. Both metam sodium and chlorpyrifos are used in massive quantities in Washington State[36], and the California researchers specifically note that their air measurements are relevant to our state. In fact, they note that exposures and risks in California may be lower than those in other states given California's more restrictive controls on pesticide use. The researchers also state that farm workers and their families may face greater risks than others because of where they live and work.[37]

California's comprehensive government air monitoring is supplemented by substantial data collected by scientists affiliated with the international non-profit organization, Pesticide Action Network. Air tests done by PAN document that inhalation exposures are common, and frequently exceed health guidelines. They have also shown that for many pesticides drift and high exposures can occur well after applications have ended as pesticides rise ("volatilize") from plants and travel to neighboring lands.[38]

III. Government's Response: A Failure to Protect

Government agencies have done little to address, or even acknowledge the widespread problem of agricultural pesticide exposures and health effects experienced by farm workers and their families. At the federal level, the U.S. Environmental Protection Agency's re-registration decisions have perpetuated agricultural use of organophosphates, carbamates, and other highly toxic pesticides, despite determinations of unacceptable risk for workers.[39] The agency has done little to promote the use of less toxic alternatives. It has failed to require medical monitoring of farm workers or to adopt other measures to reduce exposures and protect workers and their families.

In Washington State the Department of Agriculture (WSDA) and the Department of Labor and Industries (L&I) have also failed workers and their families. In fact, even as the evidence has mounted about the need for more protections, in important ways, the state has moved backwards on this issue. The following governmental acts and omissions have combined to leave workers and their families in harm's way.

1). Failing to Promote Alternatives. Using non-toxic or less toxic alternatives, including non-chemical farming techniques, is the most effective way to reduce exposures for workers and their families. Nonetheless, WSDA, L&I and other agencies have not articulated or advanced meaningful programs for encouraging these alternatives in our state. State tax policies actually encourage use of agricultural pesticides by exempting them from sales taxes.[40] This stands in sharp contrast to California where an assessment on pesticides sold for use in that state generates substantial revenues which fund pesticide regulatory programs.

Exposure issues continue to be framed as a false choice between ending exposures and supporting growers. In fact, sustainable agriculture can protect both health and farms. As one example, pheromone mating disruption and other organic alternatives are already being used successfully on apple orchards in our state. Workers and others are not exposed to OPs in and near these orchards because OPs are not used at all. A recent study compared organic, integrated and conventional apple orchards in Washington State. All three had similar apple yields, but the organic and integrated systems had higher soil quality and potentially lower negative environmental impacts than the conventional system. The organic system produced sweeter and less tart apples, higher profitability and greater energy efficiency. The authors stated that their data indicate "that the organic system ranked first in environmental and economic sustainability, the integrated system second and the conventional system last."[41]

Increasingly consumers are demanding organic produce. The U.S. organic market is projected to reach a value of $30.7 billion by 2007, with a five-year compound annual growth rate of 21.4 percent between 2002 and 2007, compared to a 21.2% rate between 1997 and 2002.[42] The global market for organic food and drink reached $23 billion in 2002, and continued growth is predicted for the global food industry.[43] Studies documenting the presence of OPs and other pesticides in food fuel this increasing demand. A recent study in Seattle compared OP residues in the urine of children who ate organic foods to those who did not, for example.[44] The authors noted that their data suggest that

consuming organic products can reduce children's exposure levels from above to below EPA safety guidelines.

2) Undercutting Enforcement and Enforcers. In the last 18 months, WSDA management has dramatically undercut the ability of its inspectors to enforce pesticide regulations.

First, as encouraged by the Washington State Farm Bureau, and without notice to or input from farm workers, WSDA weakened its Right of Entry policy in April of 2004.[45] The amended policy reduces the ability of inspectors to gain access to farms and orchards in order to protect workers. The state Pesticide Application Act authorizes warrants if access to *any* land is denied, including for routine inspections. In contrast, the new WSDA policy allows for warrants only for "unusual and compelling circumstances", a phrase that is not defined. The policy acknowledges that warrantless inspections may be justified for emergencies under the "exigent circumstances" exception. But it apparently restricts the use of the exception, stating that it is to be used "only under clearly unusual circumstances", again an undefined term. Further tying inspectors hands, the policy requires them to obtain the permission of their supervisors before using the exigent circumstance exception. By definition, exigent circumstances require immediate action; enforcement should not be halted when supervisors are unavailable. Thus, even as the need for inspector access to worksites has been highlighted by the cholinesterase testing results, WSDA has dramatically reduced that access.

Second, under pressure from the Farm Bureau, WSDA removed one of its most effective inspectors, David Zamora, from his position. An investigation found no evidence of Zamora falsifying evidence as had been alleged or of otherwise violating agency procedures. Others in WSDA's compliance division voted Zamora Employee of the Year in the spring of 2004. Nonetheless WSDA has refused to let Zamora return to his enforcement position. This decision has sent a clear message to remaining inspectors, growers, farm workers and others that WSDA will not defend inspectors who enforce pesticide regulations against political attacks.

Third, in the summer of 2004, WSDA's Director upheld an illogical and internally inconsistent Administrative Law Judge decision in a pesticide drift case over the objections of the WSDA Pesticide Management Division.[46] WSDA inspectors had attempted to levy a fine and suspend the license of a pesticide applicator who allowed pesticides to drift onto six vineyard workers in the Tri-Cities area. The workers saw a helicopter fly over the vineyard to an adjacent cherry orchard. When it began spraying the orchard, they immediately felt tingling sensations on their faces, burning in their eyes, nausea and headaches. One later vomited at least three times. The workers all reported a foul smell at the time of the incident. While crediting the workers' eyewitness accounts as fact, the judge overturned the applicator's fine and suspension, maintaining that WSDA had not proven that there could not have been other sources of exposure. His decision creates an impossible burden of proof which contradicts established law and common sense. If justice is not served in a case like this in which there can be no reasonable doubt that an aerial applicator directly and clearly injured workers, there is little hope of enforcement in general in agricultural pesticide cases. Despite this reality, WSDA's Director rejected the Pesticide Management Division's request that she overturn the ALJ's

decision. The Director also denied a petition for reconsideration filed by the injured workers.

These three examples demonstrate a disturbing pattern of undermining the ability of WSDA pesticide inspectors to enforce the laws protecting workers and their families from pesticides.

In addition, neither WSDA nor L&I have provided inspectors with inexpensive readily available equipment to measure pesticides in the air either in response to complaints or proactively in order to prevent exposures and injuries. And while comprehensive air monitoring is occurring in California yielding disturbing data of great relevance to Washington, state agencies have failed to put in place even an initial network of air monitors. Agency staff, workers, and policymakers remain in the dark about what is in the air and what is entering the lungs of workers, their children and others in agricultural areas.

3) Failing to Strengthen Regulations to Reduce Exposures. State agencies have not taken the initiative to strengthen regulations to protect workers and their families. They have not proposed or adopted regulations to mandate the use of enclosed cabs for pesticide applications (beyond the limited number of instances where such equipment is required on the pesticide label), to restrict and eliminate the use of airblast spray equipment, to require showers and changing areas for workers, or to require that gloves be provided for fieldworkers. Nor have they taken action in response to specific requests by farm workers and others for basic regulatory improvements to reduce exposures during transitions to sustainable agriculture:

a) Failure to Require Closed Systems. In 2003 the State Department of Agriculture rejected a petition filed by farm workers requesting adoption of a rule mandating the use of closed systems for mixing and loading of Category 1 and 2 pesticides in liquid form. L&I, the agency which should take the lead in proposing and adopting such a rule, refused to include closed systems in the cholinesterase monitoring rulemaking, at least in part because of WSDA's opposition. Closed system equipment ensures that pesticides are enclosed during mixing and loading, thereby reducing the risk of splashes, spills and vapor releases. This equipment is inexpensive and readily available.[47] While data on whether closed systems were used was not systematically collected during L&I visits to workplaces where there were cholinesterase depressions, at least one of the depression cases involved a worker who was open pouring pesticides. California has successfully required use of closed systems for Category 1 pesticides (the highest toxicity category encompassing many OPs and CBs in use in Washington State) since 1977, thereby reducing hazardous open pouring of these highly toxic pesticides. A major review of exposure studies and data in that state demonstrates that closed systems do significantly reduce worker exposures.[48]

b) Failure to Adopt Stronger Regulations To Prevent Drift. When WSDA solicited input on its general pesticide regulations in 2003, numerous groups and individuals submitted comments on pesticide drift and called for specific reforms to address this problem.[49] They cited overwhelming evidence that drift is a major cause of ongoing exposures for workers and their families. That evidence included large numbers of drift

exposure episodes reported each year to the state Pesticide Incident Reporting and Tracking system, analyses of dust and urine samples collected in large studies in Washington State, air monitoring results from California, and other evidence. Worker representatives and others requested that WSDA address this serious health hazard through rules mandating buffer zones around unprotected workers, homes and schools; restrictions on drift-prone application techniques and pesticides; maximum wind speed limits for applications; better enforcement; and other reforms. WSDA's only response was that it would form a workgroup to consider these issues in 2004. In the summer of 2004, WSDA did at last form that workgroup, but no reforms have been proposed yet. The agency narrowed discussion to drift at schools and other institutions, completely ignoring drift onto workers and their families from neighboring fields and orchards. It is not clear that WSDA will propose meaningful reforms even with respect to schools and other institutions.

In short, state and federal agencies have largely ignored the problem of farm worker community pesticide exposures, and have even taken some steps in recent years which exacerbate this problem.

IV. Time for a New Direction

Medical monitoring and new studies have made visible the impacts of agricultural pesticide use on farm workers and their families. They have illuminated the toxic exposures routinely experienced by this community, an injustice and public health hazard which must no longer be ignored. All people have a right to a safe workplace and to unpolluted homes and communities. That right is being routinely violated for farm workers and their families, and this problem must be addressed.

Concerned individuals and organizations in the United States are not the only ones calling for better protections for workers and their families. As medical monitoring results and other studies have made the problem more visible, the Consul of Mexico in Seattle, Jorge Madrazo Cuellar, has raised serious concerns about pesticide exposures in the farm worker community on behalf of the Mexican government.[50] Thus, addressing this problem is essential as a matter of maintaining a good relationship with our neighbor, ally and trading partner, Mexico.

Pesticide issues are often framed as a choice between protecting workers' health and protecting agriculture. But that is a false choice. Reliance on toxic pesticides entails major expenses, liabilities, exposures and other disadvantages for growers. In contrast, sustainable agriculture practices yield long-term benefits for farms and tap into opportunities created by increasing public demand for pesticide-free food.

It is time for a new vision of agriculture in Washington State and elsewhere, one which sustains and protects farms and farmers *and* protects the health of workers, their families and others. We call upon Governor Gregoire and President Bush to embrace this new vision and to take the following specific actions.

A. RECOMMENDATIONS FOR GOVERNOR GREGOIRE

1) Establish a new program to end the use of the most dangerous pesticides and to ensure that these are replaced with alternative methods or products which protect workers and their families. This program should:

a) Set deadlines by which use of the most dangerous pesticides must end. These pesticides should include organophosphates, carbamates, other acutely toxic pesticides, and pesticides which can cause cancer, birth defects or other serious health problems.

b) Provide ample funding to help growers make transitions to alternatives, for research to develop alternatives, and for other measures to promote sustainable agriculture, and

c) Provide for worker involvement in planning and implementing transitions to alternatives.

2) Direct state agencies to take immediate steps to reduce exposures during transitions to alternatives. These measures are not a substitute for phasing out dangerous pesticides, but are important in the interim. In particular, we urge Governor Gregoire to:

a) Improve and expand implementation of the cholinesterase monitoring rule:

i) Direct L&I to use its enforcement authorities to ensure timely workplace audits, worker removals, and collection of information,
ii) Direct L&I to improve and expand collection of necessary data to ensure worker protections.
iii) Establish a pilot program for medical monitoring of field workers.
iv) Provide adequate funding for the medical monitoring program.

b) Enable and encourage enforcement staff at WSDA and L&I to do their jobs:

i) Direct WSDA to revise its Right of Entry policy to make it consistent with its statutory enforcement responsibility.
ii) Launch an independent review of the decision to remove WSDA inspector Dave Zamora from his enforcement position and reconsider that decision.
iii) Direct WSDA to reverse its position in the matter of *In Re: David F. Bender*, in order to protect workers and their families from pesticide drift.
iv) Provide air monitoring equipment to inspectors at WSDA and L&I and establish a comprehensive air monitoring program.

c) Take immediate steps to strengthen regulations. In particular:

i) Direct L&I to propose rules mandating the use of closed systems for the mixing and loading of all liquid Category 1 and 2 pesticides in Washington State.
ii) Direct WSDA to propose rules establishing no-spray buffer zones around unprotected workers, their homes, schools, and other institutions. Direct the agency to adopt other measures to reduce pesticide drift including restrictions on the use of airblast sprayers and other drift-prone equipment,
iii) Direct L&I to adopt rules mandating the use of enclosed cabs for pesticide applications, increased PPE such as gloves for fieldworkers and full-face respirators for handlers, provision of showers and changing areas at workplaces, and other protections.

B. RECOMMENDATIONS FOR PRESIDENT BUSH

1) Take meaningful steps to end use of dangerous pesticides and to promote safe alternatives, including the following:

a) Cancel registrations for azinphos methyl, chlorpyrifos, other Category 1 and 2 OPs and CBs, and other highly toxic pesticides.
b) Provide leadership and support for the development and use of alternatives to pesticides on agricultural crops.

2) Require cholinesterase monitoring on a national basis for farm workers who handle OPs and CBs.

3) Mandate protections proposed in this report to Governor Gregoire, such as mandatory enclosed cab use and closed systems for mixing and loading, on a national level.

ENDNOTES

[1] Approximately 289,000 members of migrant and seasonal farm worker families live in Washington State. Of these residents, approximately 65,000 are migrant farm workers, 122,000 are seasonal farm workers, and 150,000 are non-farmworkers (typically children or other dependents) in migrant or seasonal farm worker households. Source: A. Larson "Migrant and Seasonal Farmworker Enumeration Profiles Study: Washington" (2000) as cited in Columbia Legal Service comments to Mexico, Canada and the United States at a forum of the North American Agreement on Labor Cooperation (NAALC), 2001.

[2] Washington Department of Labor & Industries, "Cholinesterase Monitoring of Pesticide Handlers in Agriculture", presentation to House Commerce & Labor Committee, January 13, 2005. L&I's numbers do not include 4 workers with removal level depressions whom L&I reinstated at their workplaces. L&I reinstated the workers based on re-running of baselines which had seemed high to Department of Health staff. The Scientific Advisory Committee objected to this action, indicating that the original baselines were more accurate then retests. The Committee counts the reinstated workers in its own analyses. This report includes the 4 workers.

[3] The Seattle Times reported on May 13th that "almost 24%" of the workers with follow-up tests to date had had significant depressions. The correct statistic for the pre-May 13th time period was actually "almost 25%", but at that time agency officials were unaware of the fact that the Farm Bureau and others had submitted blood samples from non-farm workers which skewed preliminary results. (See footnote 4 for more information on falsified samples.)

[4] It should also be noted that during the year blood samples from non-farm workers were submitted to the state laboratory as if they were from farm workers by growers and others who sought to "test" the program. Agency staff believe they have weeded out all these false samples, but cannot be certain of this. The Farm Bureau spurred the submission of these false samples with assistance from Scientific Advisory Committee members Dr. Steven Smith and Dr. Alan Felsot, Stakeholder Advisory Committee member Kirk Mayer, and other individuals. The scheme was discovered when alert Department of Health staff became suspicious about certain samples and investigated. Farm worker representatives became aware of contamination of the farm worker test results database in the fall only as the result of reviewing documents obtained through a Public Disclosure Act.
The Farm Bureau and others involved in submitting false samples claimed that they had to do so as a quality control test for the program. L&I had rejected earlier suggestions from these parties that grower-solicited "controls" submit samples, but the Bureau proceeded despite this. L&I had noted that there are scientific inadequacies with grower-solicited controls. (While not farm workers, they themselves may be exposed to OPs and CBs by virtue of where they live and work, and thus might not be good controls, for example.) According to L&I staff, none of the Farm Bureau samples were identified as depressions. (Email communication from Stefan Dobratz, L&I, November 10, 2004.) L&I and DOH did implement their own trackable quality control program based on full and open committee discussion. This program also failed to find data quality problems. (See draft Scientific Advisory Committee report,11/10/04 p. 21.)

[5] Scientific Advisory Committee, Draft Report 11/10/04 at 48.

[6] Scientific Advisory Committee, Draft Report at 57.

[7] Scientific Advisory Committee, Draft Report at 17, 57.

[8] Scientific Advisory Committee, Draft report at 63.

[9] Scientific Advisory Committee, Draft report at 64. See also p. 62.

[10] Scientific Advisory Committee, Draft report, at 57.

[11] Department of Labor & Industries, "ChE Log", provided to Stakeholder Advisory Committee on June 22, 2004

[12] RCW 49.17.250(1)

[13] See for example, September 12, 2003 Comments of Columbia Legal Services to L&I.

[14] L&I, "Cholinesterase Monitoring of Pesticide Handlers in Agriculture", Presentation to the Legislature, January 13, 2005, p.7

[15] These summaries report on consultations with 19 of 31 employers of workers with significant depressions, conducted at 21 worksites.

[16] Scientific Advisory Committee, Draft Report, 11/10/04.

[17] L&I, "Cholinesterase Monitoring of Pesticide Handlers in Agriculture", Presentation to the Legislature, January 13, 2005"; and "Cholinesterase Monitoring of Pesticide Handlers in Agriculture. Report to the Legislature", Draft 1/4/05.

[18] Scientific Advisory Committee, Draft Report, 11/10/04 at 36, 37. Diazinon and oxaymyl (Vydate) were also used, each by one handler, according to the case summaries. The list of pesticides emphasized by the Scientific

Advisory Committee dominate the 19 case summaries as well handed out to all stakeholders by L&I. Dionex, Thionex, Dimethoate, are also mentioned.

[19] L&I Draft "Cholinesterase Monitoring of Pesticide Handlers in Agriculture. Report to the Legislature. January 4, 2005" at 10.

[20] See WAC 296-307-13045(4)(e); 40 CFR § 170.240

[21] Email communication from Kirk Mayer, Manager, Washington Growers Clearing House Association, to Michal Wood, Department of Labor & Industries, December 1, 2004

[22] IREDs (Interim Reregistration Eligibility Decisions) are downloadable at http://cfpub.epa.gov/oppref/rereg/status.cfm?show=rereg. See, for example, pages 32 to 37 in the azinphos methyl IRED.

[23] L&I Draft report to legislature, 9-11.

[24] WSDA. "WPS Compliance – Fiscal Year 2003" by Matt West (p. 5) distributed by Ann Wick of WSDA at the July 15, 2004 of the Pesticide Incident Reporting and Tracking Panel meeting.

[25] Coronado et al, "Agricultural Task and Exposure to Organophosphate Pesticides Among Farmworkers", Environmental Health Perspectives 112(2), (Feb. 2004) 142-147

[26] US EPA Interim Re-registration Eligibility Document (IRED) for azinphos-methyl, especially pages 38, 40-1, 89-90, 101-102.

[27] McMurdy et al, "Assessment of Azinphosmethyl Exposure in California Peach Harvest Workers", Archives of Environmental Health, July/August 1994, Vol. 49 (No. 4), 289-296.

[28] Thompson, et al, "Pesticide Take-Home Pathway Among Children of Agricultural Workers: Study Design, Methods, and Baseline Findings," Journal of Occupational and Environmental Medicine, 45:1 pp 42-53, (2003)

[29] Washington State Department of Health, "Summary Results of Yakima Farmworker Focus Groups About Pesticides and Health Care", September 22, 2003

[30] Curl et al, "Evaluation of Take-Home Organophosphorus Pesticide Exposure among Agricultural Workers and Their Children", Environmental Health Perspectives 110(12):787-792, (December 2002)

[31] Id.

[32] Loewenherz et al, "Biological Monitoring of Organophosphorus Pesticide Exposure among Children of Agricultural Workers in Central Washington State", Environmental Health Perspectives 105(12): 1344-1353 (December 1997)

[33] Fenske et al, "Children's Exposure to Chlorpyrifos and Parathion in an Agricultural Community in Central Washington State", Environmental Health Perspectives 110(5): 549-553 (May 2002)

[34] Simcox et al, "Pesticides in Household Dust and Soil: Exposure Pathways for Children of Agricultural Families", Environmental Health Perspectives 103(12): 1126-1134 (December 1995)

[35] Fenske et al, "Biologically Based Pesticide Dose Estimates for Children in an Agricultural Community", Environmental Health Perspectives 108(6): 515-520 (June 2000)

[36] National Agricultural Statistics Service (NASS), www.pestmanagement.info/nass/app._usage.cfm.

[37] Lee et al, "Community Exposures to Airborne Agricultural Pesticides in California: Ranking of Inhalation Risks," Environmental Health Perspectives 110(12): 1175-1184 (December 2002)

[38] See, PAN et al, "Secondhand Pesticides. Airborne Pesticide Drift in California". Available at www.panna.org.

[39] See text on pages 10-11 and 12 regarding EPA decisions related to azinphos methyl and chlorpyrifos. Similar decisions have been made by EPA regarding re-registration of other pesticides.

[40] RCW 82.04.050(8)

[41] Reganold et al, "Sustainability of three apple production systems", Nature 410, April 19, 2001, p 926-930. Integrated systems use both organic and conventional pest control methods.

[42] Datamonitor, as quoted on Organic Trade Association website, 1/18/05, http://www.ota.com/organic/mt/business.html, "Industry Statistics and Projected Growth".

[43] Organic Monitor, July 2003, as cited on Organic Trade Association website, supra.

[44] Curl et al, "Organophosphorus Pesticide Exposure of Urban and Suburban Preschool Children with Organic and Conventional Diets", Environmental Health Perspectives 111(3), March 2003, 377-382.

[45] WSDA "Policy on Entry onto Private Property for Pesticide Inspections", April 7, 2004.

[46] *In re: David F. Bender*, Docket No. 2003-AGR-0003, Before the Office of Administrative Hearings for the Department of Agriculture, State of Washington; Director's decision to uphold over staff objections: Case No. PM-02-0052, Findings of Fact, Conclusions of Law and Final Order, August 19, 2004; Director's Order Denying Petition for Reconsideration filed by farm workers, Case Number PM-02-0052, September 14, 2004.

[47] Costs for closed systems equipment from one supplier, Tuthill/Sotera, ranged from as little as $34 to $283 according to its sales brochures as of September of 2002. The California Department of Pesticide Regulation

completed a survey of closed systems used in that state in 2002 which documents the availability and use of this equipment. (Conversation with Harvard Fong, CDPR June 18, 2002; "Closed Systems: An Overview" Powerpoint presentation by Mr. Fong, 2002). A survey by Cornell University also documents the availability of closed systems: "Survey of Engineering Control Technology for Pesticide Application. January 1 to December 31, 2000". In addition many pesticides are now available in water soluble packets which are considered closed systems.

[48] R. Rutz, "Closed System Acceptance and Use in California", Pesticide Formulations and Application Systems: 7th Vol, ASTM, 968, G.B. Beestman & DIB Vander Hooven, Eds, American Society of Testing & Materials, Philadelphia (1987), 28-34.

[49] See for example comments submitted to WSDA by Farm Worker Pesticide Project, September 26, 2003.

[50] See Consul Madrazo's letters to Paul Trause (Director of L&I) and Valoria Loveland (Director of WSDA) dated June 9, 2004, and letter to Loveland dated August 2, 2004.