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Pesticide Exposure Monitoring

Background and Perspectives on Mandatory Cholinesterase Testing

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The Washington State Supreme Court has ordered the Washington Department of Labor and Industries (L&I) to develop a rule for mandatory testing of agricultural workers who handle high-toxicity organophosphate (OP) or carbamate insecticides. The goal is to identify workers who are at increased risk for overexposure and subsequent poisoning.

Legal Background

Cholinesterase is an enzyme that can be measured in the human body. Its level can be used as an indication of possible over-exposure to certain toxins including OP and carbamate pesticides. In 1995, a Technical Advisory Group (TAG) formed by L&I found that cholinesterase monitoring was technically feasible and necessary to protect worker health. TAG recommended further review toward implementing a mandatory cholinesterase-monitoring program.

A recent court case brought this issue back into the spotlight. A lawsuit was filed against the Washington Department of Labor and Industries on behalf of Juan Rios, Juan Farias, and all agricultural pesticide handlers and farm workers who mix, load, and apply pesticides. In February 2002, the state Supreme Court found that L&I had violated the Washington Industrial Safety and Health Act of 1973 (WISHA) by denying the farm workers' request for rulemaking on a mandatory cholinesterase monitoring system.

This ruling set a precedent, according to Dan Ford of Columbia Legal Services, counsel for the farm workers in the case. Now Washington L&I has a statutory duty to initiate rulemaking when



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requested and when L&I's record shows that the requested rule is both necessary and achievable.

What Happens Next?

Washington's monitoring system will require agricultural employers to conduct blood tests of workers who are at risk for OP and carbamate poisoning. The specific requirements, however, are left to L&I's discretion. WISHA requires that L&I provide the "most adequate" protection that is feasible to protect workers against material impairment of health.

Over the next several months, L&I will initiate rulemaking in a process that allows for broad stakeholder input to include labor advocacy groups, grower representatives, governmental agencies, and technical experts. In order to give stakeholders the best opportunity for involvement, public stakeholder meetings will be scheduled throughout the state and at times that fit around the agricultural industry's busy seasons. The development of the new cholinesterase monitoring rule will use the WISHA 1993 voluntary cholinesterase monitoring guideline (WAC 296-307-14520) as a template. Although a specific timeline for adoption of a final rule has not been set, the preliminary goal is to have a rule in place by February 15, 2003.

A Look at Cholinesterase

Cholinesterase, or more properly acetylcholinesterase, is an enzyme essential for normal functioning of the nervous system. In the body, acetylcholinesterase inactivates the chemical messenger acetylcholine, which is normally active at the junctions between nerves and muscles, between many nerves and glands, and at the synapses between certain nerves in the central nervous system.

When cholinesterase levels are low because of excessive inhibition, the nervous system can malfunction, producing pesticide-poisoning symptoms such as fatigue, lightheadedness, nausea, vomiting, headaches, and seizures. If levels get low enough, subsequent exposure to OP or carbamate insecticides can result in death.

A basic monitoring system would periodically test cholinesterase levels in the blood of those people at risk for cumulative exposure and insecticide poisoning. Blood samples can be drawn at a clinic and sent to a laboratory for evaluation or the entire procedure can be performed at the worksite with field test kits. Workers shown to have dangerous levels of inhibition are then identified and reassigned to prevent further exposures until their depressed cholinesterase level rises close to the normal level.

The recommendations outlined in the TAG report *Cholinesterase Monitoring in Washington State* were used by the Washington State Supreme Court to decide if a monitoring system was feasible. The report recommended:

- ◆ Medical supervision for workers who mix, load, or handle Class I or II OPs or carbamates.

- ◆ Testing for workers who handle pesticides more than 3 consecutive days, or more than a total of 6 days in a 30-day period.
- ◆ A single pre-exposure baseline measurement taken from workers each year prior to exposure.
- ◆ Follow-up testing every three to four weeks (depending on spray cycle) until spray activities are completed for the season.
- ◆ Removal of workers whose red blood cell cholinesterase is at or below 70% of baseline levels or plasma cholinesterase is at or below 60% of baseline. Workers would not be exposed to OP or carbamate pesticides until their cholinesterase levels return to 80% or more of their baseline.

Lessons from California, Concerns in Washington

Around the nation, many employers have voluntarily adopted cholinesterase monitoring as a precaution for their workers, but California is the only state with a mandatory cholinesterase monitoring standard. They have required cholinesterase monitoring since 1974 for all workers with more than six days' exposure in a single month to Class I and II OPs or carbamates. (Certain exceptions apply, such as those individuals working with closed application systems.) California employers have reduced exposures and the need for worker testing by spreading out application duties among several trained workers.

According to Dr. Mike O'Malley, Director of Employee Health at the University of California at Davis and a medical consultant with Cal/EPA, California has seen the benefit of protecting people from cumulative exposure and the possibility of poisoning. He also pointed out that the system provides an opportunity for educating employees about pesticide risks and personal protection.

Here in Washington, there are lessons to be learned and concerns to be addressed. Mary Miller, a coordinator of the TAG, suggests that "a reliable system could be developed by working with the medical, laboratory, and agricultural community. Such a system for testing, interpreting and feedback of results would be a model for surveillance of agricultural worker's health."

By addressing the following issues, our state can conduct a reliable cholinesterase monitoring program.

Impact on Employers. Currently, the Washington Growers League is conducting a survey of all growers who may be impacted by the new ruling (those who use Class I and II OP and carbamate insecticides). The Growers League will work with L&I to ensure that affected employers have an opportunity to be fully involved in and informed of the rulemaking. Mike Gempler, Executive Director of the Washington Growers League, said employers want a system with maximum effectiveness and relevance for the applicators tested, a good cost/benefit

analysis, scientific integrity of the testing (both in the field and in the lab), and employer and employee education.

Scientific Integrity. Scientists have put considerable thought into how to structure a good cholinesterase monitoring system. The challenge is to design a system that prevents false negative and false positive readings. The elements of an effective method should include:

- ◆ **Medical Supervision.** Dr. John Furman, Occupational Nurse Consultant, WISHA Policy and Technical Services, pointed out that "medical supervision is recommended for agricultural workers who handle Class I or II organophosphate or carbamate pesticides. A medical supervisor may include either a licensed physician or advanced registered nurse practitioner. Primary responsibilities of the medical supervisor may include: providing and interpreting baseline and serial cholinesterase laboratory tests; providing feedback of significant results to the employer, employee, and regulatory agencies as appropriate; recommending employee removal from pesticide exposure or review of work practices; and, maintaining copies of the cholinesterase monitoring results and other related employee medical records."
- ◆ **Uniform Testing.** Dr. O'Malley of UC Davis said California only recently standardized its laboratory testing and suggested Washington standardize from the beginning. Standardization allows a test in one lab to be followed-up in another. This is especially important in agriculture, where workers frequently change employers. Selection of this uniform method will not be easy. Dr. Barry Wilson at UC Davis explained that there is no agreed-upon standard method for testing and scientists will need to use an accurate monitoring assay.
- ◆ **Centralized Laboratory Monitoring.** Dr. Matthew Keifer with the University of Washington's Pacific Northwest Agricultural Safety and Health Center (PNASH) suggested that a centralized authority monitor laboratories to ensure the validity and reliability of their testing.
- ◆ **Centralized Data Maintenance.** The data collected during testing should be maintained in a central repository charged with following trends in pesticide exposure levels. In this way, the information can be used to benefit public health, Dr. Keifer said.
- ◆ **Proper Sample Treatment.** The blood samples must be delivered to the laboratory with procedural care including refrigeration.
- ◆ **Accurate Carbamate Test.** Dr. Keifer stated that currently there are no accurate testing methods for carbamate insecticides. In this case, cholinesterase inhibition reverses quickly, so the inhibition level seen by the time it reaches the laboratory is not what was found in the body of the worker.

- ◆ **Quick Results.** The cornerstone of this system's effectiveness is the removal of farm workers from exposure when depressed levels of cholinesterase are found. If test results are not returned quickly, workers may not be removed in time to prevent another exposure.

Education. Several groups will require specialized training. Agricultural employers will need to be fully informed about the compliance standard and the principles supporting it. Workers who handle pesticides will need to understand the monitoring system, how it will protect their privacy, and what they can do to minimize their exposure to pesticides. Health care providers at clinics, hospitals, and laboratories must understand and comply with the procedures necessary to ensure the reliability and coordination of the testing and monitoring processes.

Continued Program Evaluation. Within the next year, we will learn how broadly the rule will be defined. Further study is needed to understand how widespread Class I and II OP and carbamate use is in the state and what the incidence rate is for severe cholinesterase inhibition.

Recent federal regulations restricting the use of some OP pesticides, such as Guthion, may have reduced the use of high-hazard pesticides. Other mitigating factors such as "closed" pesticide handling systems and new, safer pesticides may further reduce workers' exposure to harmful pesticides.

The proposed monitoring system, coupled with continued data analysis, will help document the severity of the problem. It may, over time, demonstrate that there is no further risk to farm workers. Such information could make routine cholinesterase monitoring unnecessary.

Where Do We Go from Here?

Many questions remain unanswered about mandatory cholinesterase monitoring in Washington. Some of the solutions will be revealed through science and others through public participation in the rulemaking. Keep your eye on *AENews* for follow-up articles as more information is known about the specific provisions of the new rule.

To guarantee that Washington's cholinesterase monitoring system protects workers, all affected stakeholders (workers, growers, public health professionals, and L&I staff and scientists) need to be involved in developing the rule. Full participation can ensure that the rulemaking has integrity and that the resulting system is sound.

If you would like to be involved in the formulation of the proposed rule, contact Cindy Ireland, Project Manager, L&I, WISHA Services Division at 360-902-5522. Other good resources for your questions include the Washington Growers League at 509-575-6315 and the Pacific Northwest Agricultural Safety and Health Center at 1-800-330-0827.

This article has been brought to you by the Pacific Northwest Agricultural Safety and Health Center, a research center housed within the University of Washington's School of Public Health

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and Community Medicine. For additional information you may refer to the PNASH Web site at <http://depts.washington.edu/pnash> or contact the author, Marcy Harrington at marcyw@u.washington.edu (206-221-6443).

Useful Publications

"Cholinesterase Monitoring in Washington State: Report from the Technical Advisory Group" can be obtained by contacting John Furman at furk235@lni.wa.gov (360-902-5666) or Janet Kurina at kuri235@lni.wa.gov (360-902-55478).

"Cholinesterase Monitoring: The Basics," is available by contacting Marcy Harrington at marcyw@u.washington.edu (206-221-6443).

"Guidelines for Physicians" and "Medical Supervision for Physicians" are offered by California's Office of Environmental Health Hazard Assessment. These documents can be downloaded in pdf format at <http://www.oehha.ca.gov/pesticides/programs/Helpdocs1.html>.

"Jorge's New Job: Getting Tested for Cholinesterase" is worker training photo-novella in English and Spanish produced by the University of California Statewide Integrated Pest Management Project. Copies can be ordered by calling 1-800-994-889.

The Supreme Court of the State of Washington's opinion on Juan Rios and Juan Farias v. Washington Department of Labor and Industries can be found at <http://www.legalwa.org>.

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