

Medical Supervision of Pesticide Workers

Guidelines for Physicians

Who Supervise Workers
Exposed to Cholinesterase
Inhibiting Pesticides

Edition 6.0

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Pesticide and Environmental Toxicology Branch
Office of Environmental Health Hazard Assessment
California Environmental Protection Agency

Preface

The California Medical Supervision Program, a surveillance program for pesticide workers exposed to certain cholinesterase inhibiting pesticides, has been in effect since 1974. It is designed to protect these workers by monitoring their blood cholinesterase activity levels and taking actions when cholinesterase inhibition exceeds specified allowed levels. The goal of the program is to prevent cumulative inhibition of cholinesterase activity resulting from multiple exposures to highly toxic organophosphate and carbamate pesticides.

Physicians who serve as medical supervisors are required to possess a copy of the Guidelines and be aware of its contents (Title 3, California Code of Regulations, section 6728). These Guidelines inform and advise physicians on their medical supervision of pesticide workers but do not constrain the exercise of sound medical judgment.

This 6.0 edition of **Guidelines for Physicians** covers practices, regulations and laws that set forth minimum requirements and do not restrict physicians from providing more intensive medical supervision. The **Guidelines** include new provisions added to Section 105206 of the Health and Safety Code effective January 1, 2017.

Additional information on the program is provided on the Office of Environmental Health Hazard Assessment (OEHHA) website at:

<https://oehha.ca.gov/pesticides/california-medical-supervision-program>

Questions about the program and requests for assistance in performing medical supervision can be directed to OEHHA, at:

Email address: Med-Supe@oehha.ca.gov.

Phone: (510) 622-3170. Please tell the attendant that you are calling about the Medical Supervision Program.

**Two OEHHA online training courses are available
at medpested.oehha.ca.gov/signin/:**

- An online course that reviews the essential elements of the Medical Supervision Program. This course reinforces the information provided in the *Guidelines* that medical supervisors are required to know.
- An online course, Recognition, Management, and Reporting of Pesticide Illnesses. This course provides information on the diagnosis and medical management of pesticide-related illnesses and how to report them in California.
- These courses are available in *English and Spanish*.
- These courses are **free** to everyone and may offer *Continuing Medical Education credits* for physicians and nurses.

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<https://oehha.ca.gov/pesticides/california-medical-supervision-program>

Fact Sheet on Cholinesterase Testing for Monitoring Workers in the California Medical Supervision Program

NEW! Medical supervisor physicians should register with OEHHA in order to contract with an employer:
<https://oehha.ca.gov/pesticides/general-info/medical-supervisor-registration>

1. **SCREEN THE WORKER** on the initial visit to be sure he/she can work with cholinesterase inhibiting pesticides.
2. **USE A CERTIFIED LAB** and always put blood samples on ice or store at 4°C immediately after drawing. California Department of Public Health certified labs are listed at:
<https://www.cdph.ca.gov/Programs/CCDCPHP/DEODC/EHLB/Pages/CDPH-Approved-Cholinesterase-Laboratories.aspx>
3. **NEW! INDICATE THE PURPOSE OF THE TEST AND NAME OF THE PHYSICIAN** on the laboratory test requisition form if ordering a cholinesterase activity test for this program and use one of the following terms:

Baseline, Follow-up or Recovery

 Each test consists of measuring both RBC AND plasma cholinesterase (ChE) and **NOT** one or the other.
4. **ESTABLISH BASELINE.** ChE activity levels **before** follow-up testing after a 30 days exposure-free period or after the longest practicable exposure-free period possible if less than 30-days. One test is permissible although an average of two tests 3-14 days apart is recommended. **Do not use lab normal values for baselines.** Verify baseline at least every two years.
5. **ORDER FOLLOW-UP TESTS** as required. Test once within 3 days after each of the first three 30-day qualifying period. After the first three 30-day qualifying periods, testing intervals must be every other 30-day qualifying period (not necessarily continuous 60 days) unless otherwise specified in writing by the medical supervisor.
6. **COMPARE FOLLOW-UP RESULTS TO THE BASELINE** to evaluate for inhibition of ChE and make recommendations, including:

Percent of Baseline	RBC ChE	Plasma ChE
< 80%	Prompt retesting of worker and investigation of work practices by employer	
≤ 70%	Immediate removal of worker from further exposure	-
≤ 60%	-	Immediate removal of worker from further exposure

- **NEW! NOTIFY WORKER AND EMPLOYER OF RESULTS.** Ensure that both the tested worker and his/her employer receive a copy of the ChE test results, and any recommendations from the medical supervisor based on those results within 14 days of the medical supervisor receiving the results.
- 7. **NEW! REPORT PESTICIDE EXPOSURE.** Report any worker with ChE depression indicating pesticide exposure to the Local Health Officer within 24 hours.
- 8. **ALLOW RETURN TO WORK (RECOVERY).** Test frequently to determine when a worker removed from further exposure to these pesticides can resume working with them, i.e., when ChE activity levels return to ≥ 80 percent of both RBC and plasma baseline values. Notify the worker and employer when the worker can return to work.

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SUMMARY

The Medical Supervision Program (“Program”) is a surveillance program that periodically monitors blood cholinesterase activity levels in agricultural workers who regularly handle Toxicity Categories I or II organophosphate or carbamate pesticides (see Tables 1 and 2 on the following pages). Medical supervision is important because it can detect excessive pesticide exposure before workers become clinically ill.

This document is intended to guide physicians who undertake medical supervision.

Medical Supervisor Responsibilities

The medical supervisor oversees the monitoring of blood (plasma and red blood cell) cholinesterase activity levels in workers who regularly handle Toxicity Categories I or II organophosphate or carbamate pesticides and plays a critical role in ensuring the safety of these workers. The California Code of Regulations Section 6728 requires that every physician who provides this medical supervision “**possesses a copy of, and is aware of the contents of the Guidelines.**”

New Requirements & Responsibilities (in red) took effect on January 1, 2017.

In this program, the medical supervisor:

1. **(NEW)** Must register with OEHHA in order to contract with an employer. Registration is free. The registration form can be downloaded at: <http://oehha.ca.gov/pesticides/california-medical-supervision-program>
2. Orders tests for baseline levels of plasma and red blood cell cholinesterase activity levels in these workers prior to their exposure to these pesticides.
3. Orders periodic tests of both plasma and red blood cell cholinesterase activity levels for workers who are regularly handling (more than six days in a 30 consecutive day period) these pesticides within three working days after the conclusion of each 30-day qualifying period.
4. **(NEW)** Must indicate on the laboratory test requisition form:
 - A. Whether the test is for an agricultural worker in the Program. If so, then:
 - i. Must indicate the purpose of the test, that is, whether the test is for:
 - a) baseline
 - b) follow-up
 - c) recovery
 - ii. Must include the name and contact information of the medical supervisor who ordered the test. (OEHHA recommends including the name and date of birth of the worker and the contact information for the employer to facilitate follow-up.)

- B. Whether the test is for evaluation of a suspected pesticide illness case.
(Note: All physicians in California, not just medical supervisors, are required to indicate if a cholinesterase test ordered is for a possible or suspected illness due to exposure to pesticide.)
5. Ensures that cholinesterase tests ordered for the Program are done at one of the laboratories approved by the California Department of Public Health (CDPH). The list of approved laboratories is available in Appendix B and can also be viewed at: <https://www.cdph.ca.gov/Programs/CCDCPHP/DEODC/EHLB/Pages/CDPH-Approved-Cholinesterase-Laboratories.aspx>
 6. Compares the results of tests taken during periods of pesticide exposure to the baseline levels to evaluate the degree of cholinesterase activity inhibition.
 7. Based on the interpretation of the test results, makes recommendations to the employer regarding whether:
 - work practices of the worker should be reviewed immediately and errors corrected.
 - a worker should be temporarily removed from working with cholinesterase inhibiting pesticides.
 8. **(NEW)** Ensures that both the tested worker and the employer receive a copy of the test results and any recommendations based upon those results within 14 days of the medical supervisor receiving the results.
 9. **(NEW)** Must report any worker with a cholinesterase depression indicating pesticide exposure to the local health officer as a potential pesticide illness.
 10. Determines when a worker removed from working with these pesticides due to excessive exposure can resume working with these pesticides, and makes a recommendation in this regard to the employer.

Medical supervision, as discussed in this document, is separate from emergency and day-to-day medical care. Medical supervisors are not necessarily responsible for providing emergency or routine medical care. The employer may arrange with other physicians for those services if needed.

Cholinesterase Monitoring

Tables 1 and 2 below outline who to monitor and how often to monitor.

Table 1. Pesticide Workers Who Require Testing

Type of Work	Pesticides Used	Duration of Exposure
Mixers, loaders and applicators (ground & air) involved in commercial or research production of an agricultural plant commodity	Organophosphates and carbamates carrying the signal word "DANGER" or "WARNING" on label (Category I or II)	More than six days in any 30-day qualifying period ¹

¹ Any 30-day period beginning on the first day of handling in which a worker has handled Category Toxicity I and/or II organophosphate or carbamate pesticides during any part of a day for more than six calendar days. The qualifying period is considered a "sliding period", which means the 30-day period changes every day and the number of days that a worker has handled pesticides during the 30-day period must be reevaluated each day.

Table 2. Frequency and Timing of Testing

Worker Status for Pesticide¹ Exposure	Test Purpose (Marked on lab requisition)	Test Frequency
New pesticide ¹ handler	Baseline	One test is permissible, however the average of two tests spaced 3-14 days apart is recommended. Baseline should be taken after a 30-day exposure-free period ² or after the longest practicable exposure-free period possible if less than 30-days.
	Follow-up	Test ³ once for each of the first three 30-day qualifying periods. Each test should be taken within three days after the end of each qualifying period.
Regular (after the first three 30-day qualifying periods)	Follow-up	Specify testing intervals in writing or test once every two 30-day qualifying periods (not necessarily continuous 60 days).
	Baseline (For verification)	Baseline must be verified at a minimum every two years and should be done as explained above for new handler.
Removed from pesticide work due to depressed cholinesterase activity	Recovery⁴	Retest (weekly recommended) until plasma and RBC cholinesterase activity levels return to 80% or more of the baseline. At that point, the worker can return to working with these pesticides.

¹ **Organophosphates** and carbamates carrying the signal word “DANGER” or “WARNING” on label (Category I or II).

² No known exposure to cholinesterase inhibiting chemicals for at least 30 days.

³ To insure reliability of test results for a given individual, serial cholinesterase monitoring should be performed in the same California Department of Public Health (CDPH) approved laboratory using the same analytical method, whenever possible.

⁴ No current exposure to cholinesterase inhibiting pesticides

Assistance

OEHHA provides a free online course, [The Medical Supervision Program](#), which offers Continuing Medical Education credits and can help reinforce the information in this document. The course can be accessed at medpested.oehha.ca.gov/signin/.

OEHHA offers advice and consultation to physicians undertaking responsibility for medical supervision of pesticide workers. Please address inquiries to:

Office of Environmental Health Hazard Assessment
Pesticide and Environmental Toxicology Branch
1515 Clay St., 16th Floor
Oakland, California 94612
Attn: Pesticide Epidemiology Section
Telephone: (510) 622-3170
Email: Med-Supe@oehha.ca.gov
FAX: (510) 622-3218 (DO NOT fax any sensitive/HIPPA information)
Website: <https://oehha.ca.gov/pesticides/california-medical-supervision-program>

Consultation on the treatment of organophosphate poisoning can also be obtained from the following sources:

- California Poison Control System at (800) 411-8080.
- Worker Health and Safety Branch, California Department of Pesticide Regulation at (916) 445-4222
- Environmental Health Investigations Branch, California Department of Public Health at (510) 620-3620
- Occupational Health Branch, California Department of Public Health at (510) 620-5757

GUIDELINES FOR PHYSICIANS WHO SUPERVISE WORKERS EXPOSED TO CHOLINESTERASE INHIBITING PESTICIDES

Pesticide Workers Who Require Medical Supervision Testing

Regulations adopted by the California Department of Pesticide Regulation (DPR) require that employers provide medical supervision for agricultural employees (workers) who “regularly handle” a pesticide with the signal word “DANGER” (Toxicity Category I) or “WARNING” (Toxicity Category II) that contains an organophosphate or carbamate for the commercial or research production of an agricultural plant commodity.

The term “handle” means mixing, loading, transferring, applying or assisting with the application of pesticides.

“Regularly handle” means the employee is handling pesticides during any part of the day for more than six calendar days in any 30-day qualifying period beginning on the first day of handling. A complete definition of these terms can be found in Title 3, Cal. Code of Regs., section 6000 (See Appendix C).

Field workers do not need medical supervision if that is the only type of work they do because there are other means to prevent excessive exposure, such as restricted entry intervals and pre-harvest intervals.

Employees who meet the requirements stated above require periodic testing of cholinesterase (ChE) activity levels including establishment of a pre-exposure baseline level. This requirement is specified in Title 3, Cal. Code of Regs., section 6728 (see Appendix C). Medical supervision of pesticide formulators is required by a different regulation (Title 8, Cal. Code of Regs., section 3450).

ChE inhibiting pesticides

1. Toxicity categories I and II ChE inhibiting pesticides

According to DPR, the following toxicity categories I and II ChE inhibiting pesticides were used in California in amounts of 100 pounds or more in 2014 and 2015:

Acephate	Ethephon	Phorate
Aldicarb	Ethoprop	Phenmedipham
Bensulide	EPTC	Phosmet
Carbaryl	Fenamiphos	S,S,S,-Tributyl Phosphorotrithioate
Chlorpyrifos	Formetanate·HCl	Propetamphos
Chlorpropham	Malathion	Propamocarb Hydrochloride
Cycloate	Methiocarb	Propoxur
Desmedipham	Methomyl	Sodium Dimethyl Dithiocarbamate
Dichlorvos (DDVP)	Methyl Parathion	Tetrachlorvinphos
Diazinon	Naled	Thiobencarb
Dimethoate	Oxamyl	Triallate
Disulfoton	Oxydemeton-methyl	Trichlorfon

Although these pesticides are most likely of toxicity category I (“DANGER”) or II (“WARNING”), they sometimes can be found in products of toxicity category III (“CAUTION”). Workers only using category III pesticides are not required to be under the medical supervision program (“Program”). Employers can identify the categories of their products by looking at the “Precautionary Statements” and the “First Aid” sections on the labels.

Usually there are several common and trade names for each pesticide. Physicians who have questions about the chemical identity of specific pesticides can search for the information on the internet (e.g., DPR or U.S. EPA web pages that address pesticides) or contact OEHHA, their county agricultural commissioner or poison control center for assistance (see next page).

Current information on whether a pesticide is registered in California is available from DPR by calling (916) 445-4300 or at <https://cdpr.ca.gov/docs/registration/regmenu.htm>

2. Preparedness for emergency treatment of pesticides poisonings

The medical supervisor should be familiar with the current standard of practice for treatment of organophosphate and carbamate poisoning.

OEHHA offers a free online course titled Recognition, Management, and Reporting of Pesticide Illnesses. This course offers Continuing Medical Education credit and

provides information on the diagnosis and medical management of pesticide illnesses. It is available at medpested.oehha.ca.gov/signin/.

Another useful reference for recognizing pesticide illness is the 6th edition of *Recognition and Management of Pesticide Poisonings* by Reigart and Roberts, published in 2013. It has updated chapters on the treatment of organophosphate poisoning and N-methyl carbamate poisoning, which can be viewed online at: www2.epa.gov/sites/production/files/documents/rmpp_6thed_final_lowresopt.pdf.

Further consultation on the treatment of organophosphate poisoning is available from the following sources:

- California Poison Control System at (800) 411-8080
- Office of Environmental Health Hazard Assessment (OEHHA) at (510) 622-3170
- Worker Health and Safety Branch, California Department of Pesticide Regulation at (916) 445-4222
- Environmental Health Investigations Branch, California Department of Public Health at (510) 620-3620
- Occupational Health Branch, California Department of Public Health at (510) 620-5757

Medical Supervision

Biological monitoring of workers is indicated in occupations where repeated exposures to toxic chemicals may have a cumulative effect. Working with organophosphate and carbamate pesticides is such an occupation, and ChE testing is an important tool that can be used to protect pesticide workers. ChE testing, like all biological monitoring, serves to detect potentially serious individual exposures *before* the occurrence of clinical illness.

Title 3, Cal. Code of Regs., section 6728 requires that every physician who provides medical supervision “possesses a copy of, and is aware of the contents of” the Guidelines.

The following paragraphs briefly describe the nature and underlying principles of medical supervision. These are guidelines and are not intended to constrain the exercise of sound medical judgment. The regulations do not restrict the employer and physician from providing more intensive medical supervision.

1. Mutual Understanding and Agreement between Employers and Physicians

It is important that both physicians providing medical supervision and employers have a clear understanding of their relationship and their respective responsibilities. Employers are responsible for obtaining and paying for the required medical supervision. They may only contract with providers who have registered with OEHHA. Employers may wish to engage physicians’ services for a complete industrial medical program or they may wish

to provide only the basic occupational health services that are required by the state law and regulations explained below.

a. Clarification in writing of expectations and change in relationship with employer

Supervising physicians should agree **in writing** to provide medical supervision to employees and should provide the employer with such an agreement. The employer pays for medical supervision for covered employees and provides medical treatment as needed.

The supervising physicians should confirm **in writing** any verbal instructions they give to employees or recommendations given to employers such as removal of a worker from exposure or evaluation of work practices. The supervisor must ensure that **the employer and the tested worker** receive copies of the ChE results and recommendations based upon those results within 14 days of the medical supervisor's receipt of the results.

Employers are required to follow the physicians' recommendations concerning matters of occupational health.

It is good practice for physicians to provide the employers with **written** instructions concerning standard procedures, such as handling overexposures and emergencies, and scheduling ChE tests.

In addition, when physicians decide to end their responsibility as medical supervisors, they should notify employers **in writing** with enough time for employers to arrange for a replacement.

Samples of written agreement between an employer and a physician, written confirmation of employee status, requests for laboratory testing, and notification that the employee no longer needs medical supervision are provided in Appendix B.

b. Worker office visits and testing

Both the employer and the physician providing medical supervision should understand that:

- The employee is to be sent to the physician's office before he/she begins handling category toxicity I and/or II ChE inhibiting pesticides after the longest practicable exposure-free period possible, if less than 30 days, to establish a baseline. OEHHA recommends at least 30 days with no exposure to cholinesterase inhibiting chemicals to establish a baseline.
- Thereafter, the employee is to be sent as often as required by the physician. Medical services and laboratory tests that the physician considers essential for medical supervision are to be authorized by the employer and required of the employee.

Regardless of ChE test results, an employer must ensure the employee is taken to a physician immediately if the employee (Cal. Code of Regs., section 6726 (c)):

- Believes he/she has been overexposed to an organophosphate or carbamate pesticide, or
- Experiences symptoms suggestive of poisoning by any pesticides.

2. Understanding of employee's health status and work practices

In their occupational health role, supervising physicians' responsibilities go beyond the familiar therapeutic doctor-patient relationship to include preventive and consultative functions for the individual workers and for the employer's work force as a group.

a. Pre-exposure Examinations

At the initial visit of a worker, the physician should take a pre-exposure history and conduct a physical examination. The physician should obtain identifying, occupational and medical information pertinent to protecting the employees working with ChE inhibiting pesticides. Because individuals with significant respiratory, hepatic or cardiovascular impairment face special risks in jobs requiring exposure to ChE inhibiting pesticides, the physician should also inquire about a history of conditions that may be adversely affected by cholinergic reactions. Conditions in which complications may be anticipated include peptic ulcer, bronchial asthma, anemia, degenerative diseases of the central nervous system, chronic colitis, history or evidence of psychosis, and diseases such as myasthenia gravis and glaucoma, which are treated with ChE-inhibiting drugs. Workers with congenital ChE deficiency will have abnormally low plasma ChE activity, but this will not affect their ability to work with organophosphate or carbamate pesticides.

b. Worker's practice and pesticides used

Physicians should seek to be familiar with the work practices and exposures of the workers that they medically supervise. For this purpose, it is good practice for them to visit the workplaces and obtain from employers a list of the pesticides that are regularly used.

The county agricultural commissioner's office is also a good source of information on local pesticide practices. Contact information for each county agricultural commissioner is available at

<https://www.cdfa.ca.gov/exec/county/documents/countycommissionersealercontactinfo.pdf>.

Valuable information on the toxicology of specific pesticides can be obtained from label and package inserts of pesticide products and from pesticide dealers and manufacturers.

ChE Testing

It is important to remember that the toxic effect of concern is inactivation of ChE in the nervous system. Plasma and Red Blood Cell (RBC) ChE activity levels are used as measurable surrogates for monitoring this effect.

1. Plasma and RBC ChE

Both plasma and RBC ChE activity levels should be determined on each blood sample tested.

- Measuring both plasma (or serum) and RBC ChE will give a more accurate assessment of the ChE activity level and any possible exposure than measuring only one of them. Certain organophosphates/carbamates exhibit preferential inhibition of either plasma or RBC ChE activity. Therefore, both results need to be considered for proper interpretation.
- Plasma ChE, or “pseudo-ChE,” is more unstable than RBC ChE and is thus less reliable in reflecting actual enzyme depression at neuro-effector sites. It is generally more rapidly inactivated by exposure to organophosphates, but it may also be depressed by other factors such as alcohol, infection, and hepatic disease. Because plasma ChE is produced in the liver, it can be regenerated relatively quickly. After a mild exposure, there can be a rebound phenomenon resulting in elevated levels.
- RBC ChE, or “true ChE,” is biochemically the same enzyme as the acetylcholinesterase located at the neuro-effector cell synapses. It is considered a more accurate measure of the actual acetylcholinesterase activity level at the neuro-effector sites and is often depressed more slowly than plasma ChE. Regeneration of RBC ChE is slow and occurs only as new red blood cells are produced at a rate of approximately 1 percent per day.
- All blood samples collected for ChE activity measurement should be placed in ice or at 4°C until the time of the assay.

2. Ordering the test pursuant to new requirements

The medical supervisor should indicate on the laboratory test requisition form whether the test is for an agricultural worker in the Program, and, in that case, if it is for Baseline, Follow-up or Recovery. The medical supervisor should also indicate his/her name and contact information.

Under the new California requirements (Health & Safety Code Section 105206), medical supervisors in the Program are required to indicate on the laboratory test requisition form:

- A. The name and contact information for the contracted medical supervisor.
- B. If the test is for an agricultural worker in the Program and, if so, then must indicate the purpose of the test, that is, whether the test is for:
 1. **Baseline** (for tests done on workers prior to exposure to establish the level to which follow-up tests are compared).
 2. **Follow-up** (for tests done on workers who have handled ChE inhibiting pesticides more than six days in a 30-day qualifying period).

3. **Recovery** (for tests done on workers after they have been removed from working with these pesticides because their ChE activity levels dropped below one of the removal level thresholds).

3. Use of approved laboratories

Laboratory testing of ChE levels must be performed using the Ellman technique in a laboratory approved by CDPH.

- A laboratory performing ChE tests as part of medical supervision must be **approved by CDPH** and must have a quality control program and an analytical method acceptable to that department. The list of approved laboratories is available in Appendix B. Copies of the updated list of approved laboratories may be obtained by writing to the California Department of Public Health, Environmental Health Laboratory Branch, 850 Marina Bay Parkway, G365, Richmond, CA 94804, by calling (510) 620-2801, or from the website: <https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/Pages/CDPH-Approved-Cholinesterase-Laboratories.aspx>.
- The state-approved ChE testing standard method is the **Ellman technique**. The specific procedures and conditions for this technique are stated in the regulations (Appendix C). Results must be reported in International Units per mL on the converted (Ellman) scale. If a different method is used, it must be shown to be comparable to the Ellman technique and a conversion equation must be prepared. To be acceptable, the results between the alternative and the reference methods must have at least a 0.9 correlation coefficient squared (r^2). “Kit” methods, which test whole blood and do not provide separate measures for plasma and RBC ChE determinations, are not satisfactory.
- Because of marked variation among different analytical methods and among laboratories using the same analytical method, it is misleading to extrapolate from one method to another or from the results of one laboratory to another. Consequently, **baseline determinations and follow-up testing should be performed in the same laboratory** using the same method, insofar as possible.
- All laboratories that run ChE activity tests under this program are required to send the results to DPR, per Health and Safety Code Section 105206 (since January 1, 2011).

4. Establishing baseline values

Baseline tests should be taken when the worker has had no exposure to ChE inhibitors for at least 30 days (i.e. 30-day exposure-free period) and must be verified every two years.

Cal. Code of Regs., section 6728 requires the employer to provide for a physician to obtain baselines for all employees who regularly handle pesticides in Toxicity Categories I or II that contain organophosphates or carbamates, regardless of how

frequently subsequent ChE monitoring is done.

- Pre-exposure baseline levels of RBC and plasma ChE need to be established for each worker against which later values can be compared. All baseline tests should be taken when the worker has had no exposure to ChE inhibiting pesticides for at least 30 days or for the longest practicable period.
- A baseline value should be the average of two or more tests taken at least 72 hours but not more than 14 days apart at the same laboratory. If two tests are done and the difference between them exceeds 15 percent, a third baseline test should be performed within 14 days. The average of the two closest values should be considered the true baseline value. A calculator tool is available on OEHHA's website to help medical supervisors with the calculation of baseline: <https://oehha.ca.gov/pesticides/general-info/medical-supervisor-calculator>. One test is permissible if two cannot be obtained.
- When circumstances preclude the achievement of a 30-day exposure-free period for obtaining a baseline, a "working baseline"¹ should be obtained after the longest practicable exposure-free period possible, with notation as to when the last exposure occurred. If this "working baseline" is below normal or in the low-normal laboratory range, the worker should be advised to discontinue exposure for at least 30 days, at which time a new exposure-free baseline can be established.
- The baseline must be verified every two years. OEHHA recommends re-establishing it at least every two years by averaging two tests spaced 3-14 days apart that are taken after a 30-day exposure-free period. Any recent monitoring test showing that no depression has occurred should be sufficient to verify the original baseline.
- For new employees, the medical supervisor may accept previously established baseline values if they were obtained in accordance with the regulations by the same laboratory methodology and are acceptable to the laboratory that will analyze the new employee's blood samples.
- The use of a laboratory "normal range" has no place in ChE monitoring for occupational health purposes. There is a fourfold difference between the upper and lower limits of the "normal range" with some of the common laboratory methods.

¹ Baseline obtained while worker still exposed to cholinesterase inhibiting pesticides or did not reach the 30-day exposure-free period.

5. Periodic Follow-up ChE Testing

Follow-up testing should be performed if the worker handles Toxicity Category I or II ChE inhibiting pesticides during any part of the day for more than six calendar days in a 30 consecutive day period, beginning on the first day of handling.

The *minimum* frequency for ChE testing is specified in regulation (Cal. Code of Regs., section 6728(c)(2); see Appendix C). In general, ChE testing should be done during the active season when workers are regularly² handling Toxicity Categories I or II organophosphates or carbamates. Initially, the follow-up testing should be done at intervals of 30 days, or less if requested by the medical supervisor. Later, this may be increased to once every other 30-day qualifying period (not necessarily continuous 60 days) unless circumstances such as those given below indicate a need for more or less frequent testing. The purpose of ChE testing is to detect excessive exposure at an early stage so intervention can be taken to protect pesticide workers. For convenient reference, the minimum testing frequency requirements are presented in a pictorial in Figure 1 below. Explanations on testing intervals are included in the physician's sample letter to the employer in Appendix B.

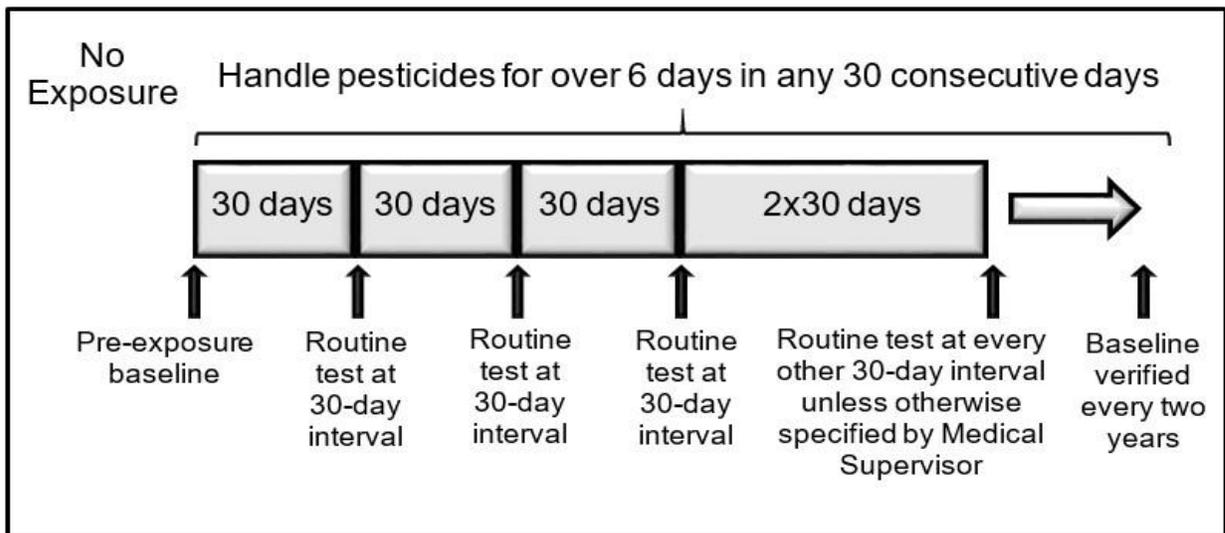


Figure 1. Minimum required frequency of cholinesterase activity testing

² Handling pesticides during any part of the day for more than 6 days six calendar days in any 30 consecutive days, beginning on the first day of handling.

The medical supervisor should consider the following factors in determining the frequency of ChE testing

- The frequency, duration and severity of potential exposure are major considerations. These will vary with the toxicity of the pesticides being used and the frequency with which they are handled. Different categories of work may involve different risks of exposure.
- The nature of the equipment being used may be an important factor.
- The degree to which good work practices are followed will have an important effect on worker safety. Such practices include the use of clean protective work clothes that are provided by employers and changed each day; showering before changing back to street clothes; proper use of gloves, boots, hats, and face shields; avoidance of eating, drinking, and smoking in pesticide-contaminated situations; and prompt and effective decontamination in the event of spills.
- The past history of an agricultural operation or of an individual is important. A company with well-maintained equipment, good discipline and work practices, and a long record of safety should require less-intensive monitoring than one with a known record of worker poisonings. Even within one company, certain individuals may occasionally require more-frequent follow-up testing on the basis of their previous work-related accident and injury history or their lack of experience.
- The physician's experience and familiarity with a specific work force may be an additional consideration.

ChE tests should be repeated any time a worker becomes sick while working with organophosphates or develops symptoms within 12 hours of their last exposure. If a worker dies within 24 hours of their last exposure to organophosphates, the physician should attempt to arrange for a post-mortem ChE test.

6. Recovery ChE Testing

After removal, in order to return to working with these pesticides, a worker should be tested weekly until both his/her plasma and RBC ChE activity levels return to 80% or more of the baselines.

When a worker is removed from pesticide work due to depressed plasma or RBC ChE activity below the respective threshold, weekly testing is recommended until plasma and RBC ChE activity levels return to 80% or more of the baselines. At that point, the worker can return to work with these pesticides.

Interpretation of ChE test results

All monitoring results must be reported as a percent of the individual’s baseline value using the following formula:

$$\text{Levels of ChE Depressions (percent of baseline)} = (\text{ChE test result at Follow-up} \div \text{ChE test result at Baseline}) \times 100$$

A calculator tool is available on OEHHA’s website to help medical supervisors with the calculation of ChE depressions: <https://oehha.ca.gov/pesticides/general-info/medical-supervisor-calculator>.

Each worker’s ChE values should be kept in an individual folder or file, preferably recorded on a separate chart or graph to facilitate interpretation of serial measurements.

Interpretation of the ChE test is a medical function. The laboratory should always send the report (test values and summary findings) to the medical supervisor for interpretation and recommendations.

The medical supervisor must ensure that the worker and his/her employer receive a copy of the ChE test results and any recommendations within 14 days of supervisor’s receipt of these results.

If a worker becomes symptomatic or ill from working with these pesticides, then that worker should be evaluated by a physician immediately. If the physician diagnoses a pesticide illness caused by these pesticides, then the worker should be removed from working with them regardless of what the worker’s ChE activity test results are.

1. Permissible Levels of ChE Depressions

Table 3 summarizes actions to be taken when plasma or RBC ChE activity level falls below the following percentage levels of the individual’s baselines.

Table 3: Action levels of RBC and plasma ChE and the associated actions required under the medical supervision program

Percent of Baseline	RBC ChE	Plasma ChE
<80%	Prompt retesting of worker and evaluation of work practices by employer	
≤70%	Immediate removal of worker from further exposure	-
≤60%	-	Immediate removal of worker from further exposure

Figure 2 shows two charts illustrating hypothetical monitoring data for two workers: one without significant exposure and the other with over-exposure. Plasma and RBC ChE activity levels are shown as a percent of the workers’ baselines. In the chart on the right, removal of the over-exposed worker from exposure after test #5 (on 6/19/2017) resulted in a return to baseline.

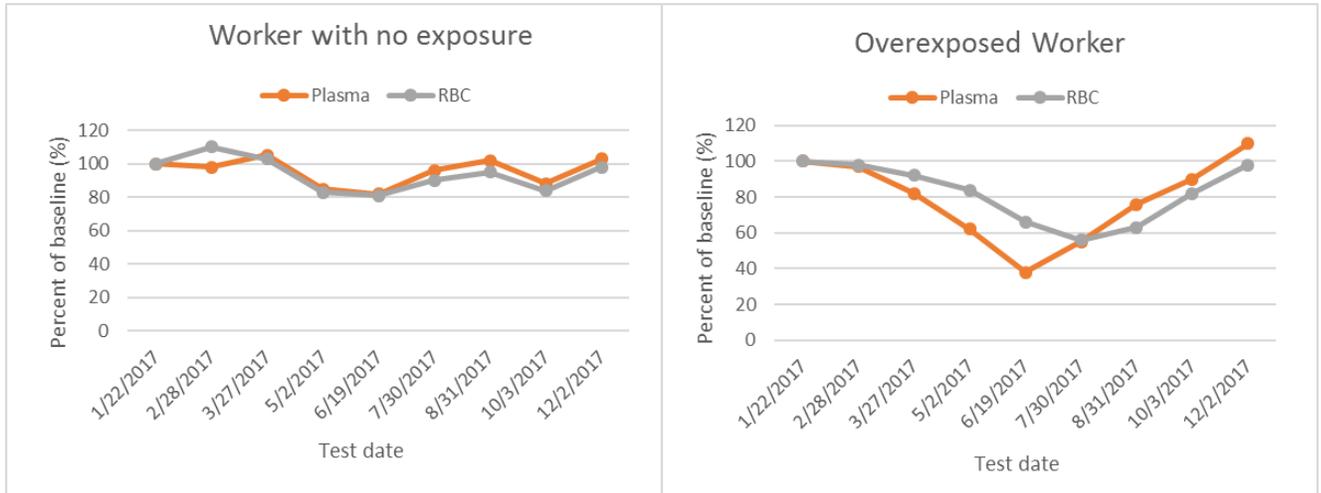


Figure 2: Illustrative cholinesterase monitoring charts. Data are shown for hypothetical tests taken at prescribed intervals. In the left chart, the decline in both the plasma and RBC cholinesterase values following test #3 (on 3/27/2017) indicates no significant exposure to cholinesterase inhibiting pesticides. In this case, both plasma and RBC cholinesterase values remained above 80% of the baseline values. In the right chart, the decline in both the plasma and RBC cholinesterase values following test #3 indicates significant exposure to cholinesterase inhibiting pesticides. On 6/19/2017, both plasma and RBC cholinesterase values dropped below their respective action levels for worker removal. The subsequent rise in plasma and RBC cholinesterase values reflects removal of the worker from continued exposure.

Limits are set for biological indicators of occupational exposures at levels that will indicate the occurrence of excessive exposure. The limit must allow an adequate margin of safety; i.e., it must be set at a level where it is not likely to be associated with manifestations of toxicity. The margin of safety is especially important in the case of ChE inhibiting pesticides because of the insidious onset and lack of or nonspecific nature of early symptoms in cases of chronic exposure.

2. Work Practice Evaluation

If a worker’s plasma and/or RBC ChE level is below 80 percent of the baseline value, prompt retesting is indicated. If the physician determines the depression is due to exposure to pesticides, the employer must then investigate the work practices of the worker, including his/her sanitation, pesticide handling procedures, and equipment usage, and conduct a review of safety equipment and its condition.

The employer is required to maintain for three years a written record of the findings, changes in equipment or procedures, and any recommendations made to the worker.

3. Removal from Exposure and Return to Work

When a worker is removed from exposure because his/her ChE activity has fallen below the acceptable limits ($\leq 60\%$ of baseline for plasma ChE or $\leq 70\%$ of baseline for RBC ChE), OEHHA recommends the worker be retested weekly. The worker should not be

allowed to return to working with ChE inhibiting pesticides until his/her plasma and RBC ChE activity levels have returned to 80 percent or greater of both plasma and RBC baseline values.

Removal from exposure means avoidance of areas where organophosphate or carbamate pesticides are handled or mixed, and avoidance of any contact with opened containers or with equipment that is used for mixing, dusting, spraying, or otherwise applying organophosphates or carbamates. This restriction includes cleaning or repairing of mixing or application equipment. In addition to handling activities, the removed worker should be kept from exposure to residues of organophosphates and carbamates.

The employer is required to maintain, for three years, written records of the dates of removal and the dates when the worker returned to work with these pesticides.

A worker removed from a job involving exposure to ChE inhibiting pesticides because of depressed ChE levels may be employed at other types of work. If no such work is available, the worker should be considered occupationally disabled under Workers' Compensation provisions until he/she is ready to be returned to the job, even if the worker is not clinically ill. Along with the pesticide illness report, the Doctor's First Report of Occupational Injury or Illness (DFR) should be filed in this case.

4. Physicians' Professional Judgment

There are medical or physical conditions other than exposure to organophosphates or carbamates that can affect ChE levels. Three percent of the population have a genetically determined lower level of plasma ChE and have an increased susceptibility to the muscle paralyzer succinylcholine, but are not more susceptible to organophosphates. These individuals usually have normal levels of RBC ChE. Plasma ChE can also be lowered by liver disease, malnutrition, alcoholism, nephrotic syndrome, early pregnancy, cocaine, carbon disulfide, organic mercury, birth control pills, and metaclopramide. RBC ChE levels can be affected by hemolytic anemia, pernicious anemia, recovery from hemorrhage, and conditions associated with reticulocytosis.

Interpretation of results requires a physician's judgment to determine if the ChE depression is caused by test-retest variability or a disease or condition unrelated to pesticide exposure. A physician has the clinical training, background, and experience to understand how other conditions can affect test results and how to put those factors in their proper context to arrive at the proper interpretation of the results. In addition, determining if a worker can work or not and how often retesting is needed are clinical decisions.

5. Physicians' Responsibility to Report Pesticide-Related Illness and Injury

NEW! California Health and Safety Code Section 105206 now requires the medical supervisor to report any worker with a ChE depression indicating pesticide exposure to the local health officer as a possible pesticide illness.

Pesticide illnesses are required to be reported to the local health officer within 24 hours. More specific information on how to report pesticide illnesses can be viewed at <https://oehha.ca.gov/pesticides/pesticide-illness-surveillance-pesticide-illness-reporting>.

For worker's compensation cases involving pesticides (see Appendix C), the treating physician is required to send a copy of the DFR to the local health officer and to the Division of Labor Statistics and Research at the Department of Industrial Relations (DIR) within seven days. In addition, the DFR should be submitted to the employer or the employer's insurance company within five days. DFR forms can be obtained at <https://oehha.ca.gov/media/downloads/pesticides/document/dlsrform5021.pdf>.

6. Assistance and Other Sources of Information

OEHHA offers advice and consultation to physicians undertaking responsibility for medical supervision of pesticide workers. Please address inquiries to:

Office of Environmental Health Hazard Assessment
Pesticide and Environmental Toxicology Branch
1515 Clay St., 16th Floor
Oakland, California 94612
Attn: Pesticide Epidemiology Section

Telephone: (510) 622-3170
FAX: (510) 622-3218
Email: Med-Supe@oehha.ca.gov

OEHHA's website (<http://www.oehha.ca.gov/pesticides/california-medical-supervision-program>) offers useful information on the Program and its evaluation.

Appendix A: QUESTIONS AND ANSWERS ABOUT THE MEDICAL SUPERVISION OF WORKERS USING CHOLINESTERASE INHIBITING PESTICIDES

Medical Supervision Program: Questions 1 to 11

1. What is the Medical Supervision Program?

Medical supervision is a surveillance program that monitors employees who regularly handle cholinesterase (ChE) inhibiting pesticides with the signal words “**Danger**” or “**Warning**” for the commercial or research production of an agricultural plant commodity.

The term “regularly handle,” as defined in the regulations, means that the employee is handling pesticides during any part of the day for more than six calendar days in any 30-consecutive-day qualifying period beginning on the first day of handling.

2. What are the pesticides with the signal words “Danger” and “Warning”?

Pesticides labeled with the signal word “**Danger**” are in Toxicity Category I and are highly acutely toxic. Pesticides labeled with the signal word “**Warning**” are in Toxicity Category II and are moderately acutely toxic. Pesticides in Toxicity Categories III and IV are less toxic and are each labeled with the signal word “**Caution**.”

3. Who is required to be monitored?

Workers who “regularly handle” organophosphate or carbamate pesticides with the signal words “Danger” or “Warning” on the label for the commercial or research production of an agricultural plant commodity are required to be monitored. They include mixers, loaders, and applicators (both ground and aerial applications).

4. Why are these employees monitored?

The purpose of medical supervision is to prevent cumulative inhibition of ChE activity resulting from multiple exposures to highly toxic organophosphate and carbamate pesticides. By monitoring the employees’ ChE levels, illness can be prevented if a significant lowering or inhibition of their ChE activity levels can be detected early and they are removed from further exposure to ChE inhibiting pesticides before symptoms occur. Monitoring employees already removed from work for depressed ChE levels helps the medical supervisor determine when it will be safe for them to return to that work. Other benefits of monitoring are enhanced vigilance, increased worker and employer awareness of how toxic these chemicals are, and development of a common goal of handling highly toxic organophosphate and carbamate pesticides safely.

5. Do field workers need medical supervision?

Field workers do not participate in the Program because there are other means to prevent excessive exposure such as restricted entry intervals and pre-harvest intervals. However, if field workers also handle the above-mentioned pesticides for more than six days in a 30-day period, then they need medical supervision.

6. How are employees/workers monitored?

Physicians periodically measure ChE activity levels in the blood (plasma and RBC) and compare these results to a previously established baseline activity levels measured prior to exposure to these pesticides. When ChE activity shows inhibition below certain levels in a monitored worker, steps should be taken to prevent that worker from being further exposed to those pesticides. These steps may include a review of the work practices, use of safety equipment, and pesticide handling practices, and for more severe inhibition, removal of the worker from work environments or situations that may lead to additional exposure.

7. Who does the actual medical supervision?

A physician registered with OEHHA and contracted by the employer does the actual medical supervision. The physician is also required to possess a copy of the ***Guidelines for Physicians Who Supervise Workers Exposed to Cholinesterase Inhibiting Pesticides*** and be aware of its contents.

8. Who is responsible for the medical supervision?

The employer is responsible for setting up the Program for his/her qualifying employees. The employer is required to have a written **agreement** (a sample agreement form is included in Appendix B of this publication) with a medical supervisor **registered** with OEHHA (<https://oehha.ca.gov/pesticides/general-info/list-registered-medical-supervisors>) and contracted to provide medical supervision. The employer is also responsible for delivering a copy of this agreement to the county agricultural commissioner no later than the time an employee begins to regularly handle Toxicity Categories I or II ChE inhibiting pesticides.

9. Who maintains the records for the Program and how long do these records have to be maintained?

The regulations require the **employer** to keep a record of the agreement with the physician to provide medical supervision, use records, all recommendations received from the medical supervisor, and all results of ChE tests required to be made on his/her employees for three years. They must be available for inspection by the employee, the Director of DPR, the county agricultural commissioner, the county health officer, or state health officials. It is desirable for employers to have the records filed together as worker groups in case other similarly exposed workers need to be contacted.

10. Is there a summary of the Guidelines laid out in this document that can be referenced to help remind the medical supervisor of the main points of this program?

Some of the main points stated in the Guidelines can be found in Tables 1 and 2 of the Summary and in the Fact Sheet on physicians' responsibilities at the beginning of this document. A free online course with CME credit, *The California Medical Supervision Program*, reinforces the information provided in the Guidelines and is available at: www.mededpesticide.org.

However, the best way to understand this program and how it operates is by reading the **Guidelines** in its entirety, and understanding the elements and details of the Program.

11. Is there any penalty for not implementing this program or not following this program correctly?

There is no set penalty for the physician for not implementing the program correctly. An effective Medical Supervision Program protects the employee, the employer and the entire work setting, as well as the physician's reputation.

The Division of Occupational Safety and Health of the Department of Industrial Relations can impose a \$250 fine on physicians who fail to report a pesticide illness (suspected or known) for any worker in this Program.

ChE testing: Questions 12 to 20

12. What tests are done?

Blood is drawn to measure the enzymes plasma ChE (also known as pseudo, serum, or butyryl ChE) and red blood cell ChE (also known as RBC, acetyl, or true ChE).

13. Why are both the plasma ChE and the RBC ChE measured?

RBC ChE is the same enzyme that is found at the neuro-effector site and is thought to better reflect acetylcholinesterase inactivation in the nervous system. However, some pesticides can preferential inhibition of either plasma or RBC ChE activity. Therefore, results of both need to be considered for proper interpretation.

14. How often are ChE tests done?

The first tests are intended to establish a baseline level for the employee prior to exposure to Toxicity Categories I and II ChE inhibiting pesticides.

Once the baseline is established, periodic follow-up testing is needed if the employee handles these pesticides for more than six days in a 30-day period (qualifying period³). After the first three 30-day qualifying periods, testing intervals will then be every other 30-day qualifying period (not necessarily continuous 60 days) unless otherwise specified in writing by the medical supervisor.

³ A qualifying period is defined as any 30-day period beginning on the first day of handling in which a worker has handled Category Toxicity I and/or II organophosphate or carbamate pesticides during any part of a day for more than six calendar days. The qualifying period is considered a "sliding period", which means the 30-day period changes every day and the number of days that a worker has handled pesticides during the 30-day period must be reevaluated each day.

15. What does Health and Safety Code Section 105206 require of medical supervisors?

The **revised** Section 105206 of the Health and Safety Code of California took effect on January 1, 2017. It requires that employers only contract with medical supervisors who are registered with OEHHA for this program. The registration form is available on the OEHHA website at: <https://oehha.ca.gov/pesticides/general-info/medical-supervisor-registration>

Medical supervisors must:

- Indicate on each laboratory test requisition form the name of the medical supervisor, if ChE tests are ordered for pesticide workers in the Program and if so, then if the tests are for a baseline, follow-up, recovery, or suspected pesticide illness.
- Ensure that the person tested and the employer both receive a copy of the test results and any recommendations based on those results from the medical supervisor within 14 days of the medical supervisor receiving the results.
- Report as a suspected pesticide illness any worker with ChE depression indicating pesticide exposure to the local health officer within 24 hours.

16. Are there specific terms medical supervisors should use to indicate the purpose of the tests?

Yes. The law requires that only the following terms be used to indicate the purpose of the test:

Baseline: For tests done on workers prior to monitoring to establish the levels to which follow-up tests are compared.

Follow-up: For tests done on workers who have handled ChE inhibiting pesticides more than six days in a 30-day period³.

Recovery: For tests done on workers after they have been removed from working with these pesticides because their ChE activity levels dropped below the action level thresholds for removal.

In addition: All physicians in California, not just medical supervisors, are required to indicate on the test requisition form whether the test is for evaluation of a suspected pesticide illness case.

17. Can a physician require more-frequent testing than what is required by the regulations?

Yes. Neither these *Guidelines* nor the regulations are intended to constrain the exercise of sound medical judgment. The regulations set forth the *minimum* requirements and do not restrict physicians from providing more-intensive supervision. The regulations clearly state “The employer shall follow the recommendations of the medical supervisor concerning matters of occupational health”.

18. Can any laboratory do the ChE tests?

No. The plasma and RBC ChE tests ordered by the medical supervisor for this Program must be done by a clinical laboratory approved by CDPH. Copies of the updated list of approved laboratories can be obtained from the California Department of Public Health, Environmental Health Laboratory Branch, 850 Marina Bay Parkway, G365, Richmond, CA 94804, by calling (510) 620-2801, or from the website: <https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/Pages/CDPH-Approved-Cholinesterase-Laboratories.aspx>

19. How important is it to store the blood samples on ice or at 4°C temperature?

Very important! To obtain the most accurate ChE assay results, the blood samples must be stored on ice or at 4°C as soon as possible after drawing and until the tests are run.

The regulations state that:

“Blood samples shall be kept in ice or at a temperature of 4°C until time of assay. If the sample is centrifuged to remove the erythrocytes from the plasma, the plasma shall be frozen at a temperature of minus 20°C until the assay is performed. If possible, the assay shall be performed within 24 hours after collection.”

20. Are there other factors of the testing procedure that can affect the test results?

Yes. One of these is the blood draw itself. The area from which the blood is drawn should be as clean as possible because even a small amount of pesticide contaminant can affect the results. A standard vacutainer with EDTA or heparin as the anticoagulant should be used for sample collection.

The assay method used can also affect the results. The standard Ellman technique for the ChE assay is recommended in the regulations. If an alternative method is used, the results have to be convertible to units of the Ellman standard with at least 90 percent correlation coefficient squared ($r^2 = 0.90$).

Because there is variability in results from different laboratories, it is recommended that the same laboratory and analytical method be used for the baseline level determination and for the periodic follow-up determinations.

Other factors that can potentially affect the results are laboratory error, incorrect calculation of the baseline, incorrect calculation of follow-up test results relative to the baseline, and poor record keeping and organization.

Baseline: Questions: 21 to 25

21. What are baseline values?

Baseline values are the plasma ChE and RBC ChE determinations measured prior to an employee's exposure to Toxicity Categories I and II ChE inhibiting pesticides.

By regulation, this is required of all employees who will “regularly handle” these pesticides regardless of how frequently subsequent monitoring is done.

22. Why is the baseline value important?

The baseline value is important because it is the level against which all subsequent post-exposure ChE determinations are compared. Because the baseline value is determined before the employee is exposed and the periodic follow-up tests occur after exposure, it is assumed that any subsequent inhibition of the ChE activity is due to exposure to these pesticides. All of the subsequent determinations must be interpreted as a percent of the baseline value. Effective monitoring requires an accurate baseline.

23. How is the baseline value established?

All baseline tests should be taken when the worker has had no exposure to ChE inhibitors for at least 30 days. Although one test is permissible under the regulations, the baseline value should be the average of two or more tests taken at least 72 hours but not more than 14 days apart and assayed at the same laboratory. If the difference between the two tests exceeds 15 percent, then a third test should be done. The average of the two closest values is designated as the baseline activity level.

A calculator tool is available on OEHHA’s website to help medical supervisors with the calculation of baseline: <https://oehha.ca.gov/pesticides/general-info/medical-supervisor-calculator>.

The reason that plasma and RBC ChE levels should each be measured two or three times to establish the baseline is to reduce test-retest variability. This should reduce the number of false positive and false negative results from the periodic follow-up tests. Test-retest variability may be around 5 to 10 percent but could be as much as 15 percent to 23 percent.

24. What if circumstances don’t allow the worker to achieve a 30-day exposure-free period from ChE inhibiting pesticides?

A 30-day exposure-free period from ChE inhibiting pesticides prior to obtaining the baseline tests is the best and preferred way to establish the most accurate baseline value. However, if circumstances preclude collecting blood samples after a 30-day exposure-free period, then a “working baseline”⁴ should be obtained after the longest practicable exposure-free period possible with a notation indicating the date of the last exposure. If the “working baseline” is below normal or in the low-normal laboratory range, the worker should be advised to discontinue exposure for at least 30 days, at which time a new exposure-free baseline can be established.

⁴ Baseline obtained while worker still exposed to cholinesterase inhibiting pesticides or did not reach the 30 days exposure-free period.

25. Can a ChE activity determination be compared to the laboratory normal levels instead of to a baseline value?

No. Laboratory “normal levels” can have a very wide range. If this wide range of ChE activity levels were used instead of a baseline for comparison with the follow-up ChE activity levels, it would be difficult, if not impossible, to determine if an individual’s ChE activity levels were actually depressed. In addition, a significant number of people have baseline activity values that fall outside of the laboratory normal range. Therefore, the most accurate comparison is to each individual’s own baseline value, determined prior to any exposure to ChE inhibiting pesticides.

Action Levels: Questions 26 to 30

26. How do you compare baseline and follow-up test results?

Results of the periodic follow-up tests must be interpreted as a percent of the employee’s pre-exposure baseline ChE activity as follows:

$$\text{Levels of ChE Depressions (expressed as percent of baseline)} \\ = (\text{ChE test result at Follow-up} \div \text{ChE test result at Baseline}) \times 100$$

A calculator tool is available on OEHHA’s website to help medical supervisors with the calculation of depression: <https://oehha.ca.gov/pesticides/general-info/medical-supervisor-calculator>.

27. What are the levels of ChE inhibition that trigger actions to be taken, and what are these actions?

After a baseline value is established, working season testing (periodic follow-up testing) is needed if the worker handles Toxicity Category I or II ChE inhibiting pesticides for more than six days in a 30-day qualifying period, beginning on the first day of handling. If the plasma or RBC ChE activity level falls below the following percentages of their baselines, the following actions are triggered:

< 80 percent of the RBC or plasma ChE baseline values: The employer must investigate the work practices of the employee. Depression to this level is also an indication for prompt retesting.

≤ 70 percent of RBC ChE baseline value: The employer must remove an employee whose RBC ChE activity level falls below this level from exposure to ChE inhibiting pesticides.

≤ 60 percent of plasma ChE baseline value: The employer must remove an employee whose plasma ChE activity level falls below this level from exposure to ChE inhibiting pesticides.

28. If an employee is removed from working with ChE inhibiting pesticides, when can this employee return to work with those pesticides?

The employee should be retested weekly and will not be allowed to return to work with these pesticides until his/her RBC ChE and plasma ChE activity levels both return to 80 percent or more of the baseline values.

29. If an employee's ChE activity levels fall below the removal levels, does it mean that the employee cannot work at all?

No. The employee cannot work with ChE inhibiting pesticides until his/her inhibited ChE activity levels (the RBC or plasma ChE, or both) recovers to 80 percent or more of the baseline values. However, unless this employee has other work restrictions, he/she can work modified duty and do any other available work for which he/she is qualified.

30. If the ChE activity levels are elevated above baseline, does the employee have to be removed from further exposure to ChE inhibiting pesticides?

No. An elevation in ChE activity levels is not an adverse effect of exposure to ChE inhibiting pesticides. A depression in ChE activity levels is an adverse biological response of exposure to ChE inhibiting pesticides and is what the Program is designed to detect.

Pesticide Illness: Questions 31 to 33

31. If a worker has been made ill by pesticides at work, should this worker see the medical supervisor for diagnosis and treatment?

Not necessarily. The physician with whom the employer has the agreement is only contracted to provide medical supervision as set forth in the regulations and described in these **Guidelines**. Under this agreement, the medical supervisor is not required to provide emergency or other medical treatment. The medical supervisor, the employer, and the employee can have other arrangements and agreements to provide diagnosis and treatment for occupational or other illnesses or injuries, in which case, the designated physician would see this worker.

32. Are pesticide-related illnesses reportable?

Yes. A physician who knows or believes that a patient is suffering from a pesticide poisoning or any disease or condition caused by a pesticide must report that fact to the local health officer within 24 hours by phone, fax or using CalREDIE Provider Portal. If consulted, the Poison Control Center can make this report for the treating physician. Poisoning from all pesticides, including the ChE inhibiting pesticides, is reportable. Definitely diagnosed cases as well as suspected cases are reportable (as required by the Health and Safety Code Section 105200).

More information on reporting pesticide illnesses can be viewed at <http://www.oehha.ca.gov/pesticides/programs/Pestrpt.html>

33. If a worker's ChE levels indicate pesticide exposure, should it be reported to the local health officer as a pesticide illness? If so, how, when, and to whom should it be reported?

Since January 2017, any depression indicating exposure is required by law to be reported as a pesticide-related illness.

Appendix B: Sample Forms and Other Material to Aid the Medical Supervisor

New Medical Supervisor - Employer Agreement

Notification by employer to physician regarding new employee to be supervised

Notification by physician to employer and employee regarding new employee to be supervised

Physician's recommendations to employee and employer to be sent with test results within 14 days of physician receiving test results

Medical Supervisor Registration Form

Laboratories approved by CDPH to perform ChE testing under the Medical Supervision Program

New Medical Supervisor - Employer Agreement

(Medical Supervisor sends to employer after receipt of request for services)

To: _____
(Employer First and Last Name)

Company Name _____

Address: _____

You have requested that I provide medical supervision to your employees that handle cholinesterase inhibiting pesticides requiring such supervision, as described in the Pesticide Safety Regulations (Section 6728, Title 3, California Code of Regulations). This involves testing for cholinesterase activity in red blood cells and plasma as outlined below.

The employees covered by this regulation are workers engaged in production agriculture who “regularly handle” specific pesticides. The specific pesticides are organophosphates and carbamates in Toxicity Categories I or II. They have the signal word “DANGER” or “WARNING” respectively on the label. “Regularly handle” is defined as working with the pesticide during any part of a day for more than six days in any 30 consecutive day qualifying period.

If you intend to have an employee regularly handling these pesticides as a mixer, loader, ground or aerial applicator, *it is your responsibility* to do the following:

1. **Before pesticide exposure begins**, have that employee come to me for an examination and blood tests to establish a baseline cholinesterase level before exposure begins. Although one cholinesterase activity test is permissible, two blood tests 3 to 14 days apart are preferable. If an employee has had any recent exposure to such pesticides, further exposures must be avoided for as long as practicable, preferably at least 30 days before the baseline testing period begins.
2. Send a copy of this form to the County Agricultural Commissioner prior to the time when the employee begins to “regularly handle” these pesticides.
3. Within three working days after meeting the qualifying standard for “regularly handling” the pesticides described above, ensure that the employee has cholinesterase activity tests; that is, ensure the employee obtains from me a requisition for laboratory testing and that the employee has the test performed.
4. After the first three tests at 30-day intervals, when the employee continues to regularly handle the pesticides described above, ensure testing occurs every other 30-day qualifying period (not necessarily continuous 60 days), unless I indicate otherwise to you in writing.
5. Ensure that subsequent cholinesterase activity determinations are conducted at least as frequently as I recommend.

The above testing intervals are subject to change. I will schedule more frequent tests and designate non-exposure periods as necessary, according to the test results. When work experience demonstrates little effect on cholinesterase values, I may schedule less frequent follow-up testing. With mutual cooperation we should be able to assure your employees a safe work environment.

In agreeing to provide medical supervision, I expect your firm to abide by the provisions in the regulations and I intend to perform my functions in accordance with the regulations and the *Guidelines for Physicians Who Supervise Workers Exposed to Cholinesterase Inhibiting Pesticides*, 6.0 Edition published by the Office of Environmental Health Hazard Assessment. I confirm that I am currently registered as a medical supervisor with the Office of Environmental Health Hazard Assessment. And if I decide not to renew my registration, I will notify you at the earliest opportunity.

Signed by Physician: _____, M.D.

Date: _____

Address: _____

Notification by employer to physician regarding new employee to be supervised

To: _____
(Physician First and Last Name)

Employer

Name _____ Job Title _____

Address _____

Phone _____

Employee

Name _____ Job Title _____

Address _____

Phone _____

The above named employee will regularly handle Toxicity Categories I and/or II organophosphate and/or carbamate pesticides beginning on (Date) _____ . The employee needs to be tested for baseline cholinesterase activity before he/she begins to handle these pesticides.

Signed by Employer _____

Date _____

Notification by physician to employer and employee regarding new employee to be supervised

To: _____
(Employer First and Last Name)

Name of Employee Referred _____

1. [] is medically approved for employment as _____
using cholinesterase inhibiting pesticides. (Job Title)

2. [] is not recommended for such employment.

3. [] is not approved for work with cholinesterase inhibiting pesticides pending re-examination.

4. [] is to return for re-testing of cholinesterase level on (Date)_____.

5. [] is to return for medical examination at a time to be determined by the physician or on (Date)_____.

Signed by Physician _____, M.D.

Date _____

Physician's recommendations to employee and employer to be sent with test results within 14 days of physician receiving test results

To: _____
(Employer First and Last Name)

Address: _____

RE: _____
(Employee First and Last Name)

After reviewing test results from the above named employee, I recommend:

1. The employee can continue working with cholinesterase inhibiting pesticides without further restrictions.
2. Work practices surrounding his or her job and attention to personal hygiene should be reviewed immediately and errors corrected.
3. The employee is to have a routine follow-up, or emergency follow-up laboratory test at:

(Laboratory)	(Date & Time)
--------------	---------------

4. The employee is to be restricted from any further exposure to organophosphate and carbamate pesticides (including cleaning or repair of mixing or application equipment) at least until he or she has reported to this office on (Date) _____ and until the employee has been released by me to resume work.

5. The employee is to be hospitalized under the care of:

_____, M.D.

6. Other special directions (specify): _____

Signed _____, M.D.

Date _____



MEDICAL SUPERVISOR REGISTRATION FORM

Registration Instructions

1. Please return the completed form to OEHHA using the mailing address, email address or fax number provided at the end of this form.
2. If there is more than one medical supervisor at a clinic, each one must register with OEHHA.
3. Each medical supervisor's name, and contact information of the clinic(s) where he/she works will be posted on OEHHA's public website to provide agricultural employers information on the medical supervisors in their area.

Medical Supervisor Information

First Name:

Last Name:

Work Telephone:

Medical License #

Work Email:

Primary Clinic Information

Clinic Name:

Street Address:

City:

Zip Code:

Contact Person Name:

Telephone:

Work Email:

Website (if available)

Second Clinic Information (if necessary)

If the medical supervisor also works at a second clinic, please fill out the following:

Clinic Name:

Street Address:

City:

Zip Code:

Contact Person Name:

Telephone:

Work Email:

Website (if available)

Third Clinic Information (if necessary)

If the medical supervisor also works at a third clinic, please fill out the following.

Clinic Name:

Street Address:

City:

Zip Code:

Contact Person Name

Telephone:

Work Email:

Website (if available)

Other Staff Under Your Supervision Who Order Cholinesterase Tests For Agricultural Pesticide Handlers

First Name:

Last Name:

Title:

First Name:

Last Name:

Title:

First Name:

Last Name:

Title:

First Name:

Last Name:

Title:

Contact Information For Person Completing The Form

First Name:

Last Name:

Telephone:

Work Email:

Please mail the completed form to:

**Pesticide Epidemiology Section, CalEPA,
OEHHA Post Office Box 4010
Sacramento, CA, 95812-4010**

Or fax to: (916) 327-7335

Or email to: med-supe@oehha.ca.gov

Thank You!

Page 2 of 2



KAREN L. SMITH, MD, MPH
Director and State Public Health Officer

State of California—Health and Human Services Agency
California Department of Public Health
Environmental Health Laboratory
Jed Waldman, PhD, Chief



GAVIN NEWSOM
Governor

**Laboratories Approved for Cholinesterase Testing
for Occupational Health Surveillance, per California Code of Regulations***

This List is dated **April 16, 2019**;
it replaces and supersedes the List dated March 20, 2018.

ARUP Laboratories

500 Chipeta Way
Salt Lake City, UT 84108
(800) 522-2787

<https://www.aruplab.com>

CLIA No. 46D0523979
CA Lab No. COS 800007

Laboratory Corporation of America (LabCorp)

1447 York Court
Burlington, NC 27215
(336) 584-5171

<https://www.labcorp.com>

CLIA No. 34D0655059
CA Lab No. COS 00800058

Pacific Toxicology Laboratories

9458 De Soto Avenue
Chatsworth, CA 91311
(800) 328-6942

<http://www.pactox.com>

CLIA No. 05D0542735
CA Lab No. CLF 4442

Quest Diagnostics

3714 Northgate Blvd.
Sacramento, CA 95834
(866) 697-8378

<http://www.questdiagnostics.com>

CLIA No. 05D0644209
CA Lab No. CLF253

Quest Diagnostics – Nichols Institute

33608 Ortega Highway
San Juan Capistrano, CA 92690
(949) 728-4000

<http://www.questdiagnostics.com>

CLIA No. 05D0643352
CA Lab No. CLF 00002562

This list is *subject to change*; the current list is posted on-line at
<https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/Pages/CDPH-Approved-Cholinesterase-Laboratories.aspx>

Direct inquiries to Ms. Lissah Johnson,
Environmental Health Laboratory
850 Marina Bay Parkway, G365
Richmond, CA 94804
Lissah.Johnson@cdph.ca.gov

*CCR Title 3, Section 6728(f); see <https://www.cdpr.ca.gov/docs/legbills/calcode/030302.htm>

850 Marina Bay Parkway, G-365, Richmond, CA 94804
(510) 620-2803

<https://www.cdph.ca.gov/Programs/CCDPHP/DEODC/EHLB/Pages/EHL-Program-Landing-Page.aspx>



Appendix C: Excerpts from California Regulations and Statutes Pertaining to Medical Supervision

Definition of terms related to Medical Supervision (Title 3, Cal. Code of Regs., section 6000)

This Regulation defines terms used in California regulatory programs for pesticides. Terms below excerpted from regulation based on relevance to California's Medical Supervision Program.

"Carbamates" means esters of N-methyl carbamic acid which inhibit cholinesterase.

"Employee" means any person who, for any kind of compensation, performs work, services, or activities covered by this division.

"Employer" means any person who exercises primary direction and control over the work, services, or activities of an employee. A foreman, crew leader, supervisor, or similarly situated person represents the employer when hiring an employee or when exercising, or having responsibility for exercising, the primary direction and control, but is not considered the employer himself or herself.

"Fieldworker" means any person who, for any kind of compensation, performs cultural activities in a field. Fieldworker does not include persons performing tasks as a crop advisor, including field checking or scouting, making observations of the well-being of the plants, or taking samples, nor does it include local, state, or federal officials performing inspection, sampling, or other similar official duties.

"Handle" means mixing, loading, transferring, applying (including chemigation), or assisting with the application (including flagging) of pesticides, maintaining, servicing, repairing, cleaning, or handling equipment used in these activities that may contain residues, working with opened (including emptied but not rinsed) containers of pesticides, adjusting, repairing, or removing treatment site coverings, incorporating (mechanical or watered-in) pesticides into the soil, entering a treated area during any application or before the inhalation exposure level listed on pesticide product labeling has been reached or greenhouse ventilation criteria have been met, or performing the duties of a crop advisor, including field checking or scouting, making observations of the well-being of the plants, or taking samples during an application or any restricted entry interval listed on pesticide product labeling. Handle does not include local, state, or federal officials performing inspection, sampling, or other similar official duties.

"Medical supervision" means occupational health guidance and necessary associated health evaluation by a physician licensed to practice medicine.

"Organophosphates" means organophosphorus esters which inhibit cholinesterase.

"Pesticide" means:

- (a) Any substance or mixture of substances that is a pesticide as defined in the Food and Agricultural Code and includes mixtures and dilutions of pesticides;
- (b) As the term is used in Section 12995 of the Food and Agricultural Code, includes any substance or product that the user intends to be used for the pesticidal purposes specified in Sections 12753 and 12758 of the Food and Agricultural Code.

"Pesticides in toxicity category I" means pesticide products which are required to prominently display the signal word "DANGER" on the label.

"Pesticides in toxicity category II" means pesticide products which are required to prominently display the signal word "WARNING" on the label.

"Regularly handle" means that the employee is handling pesticides during any part of the day for more than six calendar days in any 30 consecutive day qualifying period beginning on the first day of handling. Any day spent or loading pesticides while exclusively using a closed system or mixing only pesticides sealed in water-soluble packets is not included for any employee who has a baseline blood cholinesterase level established pursuant to section 6728(c)(1).

Medical Supervision of Workers Handling ChE Inhibiting Pesticides (Title 3, Cal. Code of Regs., section 6728. Medical Supervision)

This regulation relates to the California's Medical Supervision Program itself. It defines the responsibilities of the employer and the relations between employers, employees, laboratories and medical supervisors. It also details the procedure to be used by the clinical laboratories to perform ChE tests.

- (a) Whenever an employee mixes, loads, or applies a pesticide with the signal word "DANGER" or "WARNING" that contains an organophosphate or carbamate, for the commercial or research production of an agricultural plant commodity, the employer shall maintain use records that identify the employee, the name of the pesticide, and the date of use. The original or copies of documents otherwise required to be maintained by this chapter may be used to meet the requirements of this Section provided they contain the information required by this Section.
- (b) Each employer who has an employee who regularly handles pesticides specified in (a) shall have a written agreement signed by a physician, that includes the names and addresses of both the physician providing the medical supervision and the employer responsible for the employees, stating that the physician has agreed to provide medical supervision and that the physician possesses a copy of, and is aware of the contents of the document "Medical Supervision of Pesticide Workers-Guidelines for Physicians" (available from the Office of Environmental Health Hazard Assessment). A copy of this agreement shall be given to the commissioner by the employer no later than when an employee begins to regularly handle pesticides specified in (a).
- (c) The employer's responsibilities for medical supervision for employees regularly handling pesticides specified in (a) shall include the following:
 - (1) All covered employees shall have baseline red cell and plasma cholinesterase determinations. Baseline values shall be verified every two years. For new employees, the medical supervisor may accept previously established baseline values if they are obtained in accordance with these regulations by the same laboratory methodology and are acceptable to the laboratory which will analyze the new employee's blood samples.
 - (2)
 - (A) The employer shall ensure that each employee, not previously under medical supervision associated with that employer, has red cell and plasma cholinesterase determinations within three working days after the conclusion of each 30-day period in which pesticides specified in (a) are regularly handled.
 - (B) After three tests at 30-day intervals, further periodic monitoring shall be at intervals specified in writing by the medical supervisor except for verification of baseline as specified in (1).
 - (C) Where the medical supervisor has made no written recommendation for continued periodic monitoring, the testing interval shall be 60 days

- (3) The employer shall keep a record of the agreement to provide medical supervision, use records, all recommendations received from the medical supervisor, and all results of cholinesterase tests required to be made on his/her employees by this Section or by the medical supervisor. Records required by this Section shall be maintained for three years and shall be available for inspection by the employee, the Director, commissioner, county health official or state health official.
 - (4) The employer shall follow the recommendations of the medical supervisor concerning matters of occupational health.
 - (5) The employer shall post the name, address, and telephone number of the medical supervisor in a prominent place at the locale where the employee usually starts the workday; or if there is no locale where the employee usually starts the workday, at each worksite; or in each work vehicle.
- (d) The employer shall investigate the work practices of any employee whose red cell or plasma cholinesterase levels fall below 80 percent of the baseline. The investigation of work practices shall include a review of the safety equipment used and its condition; and the employee's work practices which included employee sanitation, pesticide handling procedures, and equipment usage. The employer shall maintain a written record of the findings, any changes in equipment or procedures, and any recommendations made to the employee.
- (e) The employer shall remove an employee from exposure to organophosphate or carbamate pesticides if the employee's plasma cholinesterase level falls to 60 percent or less of baseline, or if red cell cholinesterase falls to 70 percent or less of baseline. The employee shall be removed from further exposure until cholinesterase values return to 80 percent or more of their respective baseline values. The employer shall maintain written records of the dates of removal and the dates when employees are returned to exposure.
- (f) To meet the requirements of these regulations, acetylcholinesterase (also known as red blood cell cholinesterase) and butyrylcholinesterase (also known as plasma or serum cholinesterase or pseudocholinesterase) tests ordered by a medical supervisor for occupational health surveillance shall be performed by a clinical laboratory currently approved by the State Department of Health Services to perform these tests. By January 1, 2000, tests shall be performed according to the procedures outlined below. If tests cannot be performed according to the following procedures, the conversion procedure outlined in 6728 (f)(8) shall be performed.
- (1) Using personnel and procedures acceptable to the Department of Health Services (Business and Professions Code sections 1242, 1243, 1246, 1269, 2070; Health and Safety Code sections 120580, 1607), blood collection and storage shall be done according to the following conditions:
 - (A) Blood samples shall be kept in ice or at a temperature of 4 ° C until time of assay. If the sample is centrifuged to remove the erythrocytes from the plasma, the plasma shall be stored frozen at a temperature of minus 20 ° C until the assay is performed. If possible, the assay shall be performed within 24 hours after blood collection. Time of sample collection, analysis, and storage conditions shall be specified on the report.
 - (B) Ethylenediaminetetraacetic acid (EDTA) or heparin shall be used as an anticoagulant in a standard vacutainer tube.
 - (2) The reagents and equipment shall conform to the following conditions:
 - (A) A spectrophotometer at a wavelength between 405 and 425 nanometers shall be used.
 - (B) The assay shall be performed at a temperature of 25 ° C.
 - (C) The following conditions regarding the buffer/chromogen shall apply:
 1. A sodium phosphate buffer shall be used at a concentration of 0.1 M adjusted to a pH of 8.0 with a pH meter calibrated at both 7.0 and 10.0.
 2. Dithiobisnitrobenzoic acid (DTNB) at a stock concentration of 9.7 mM in 0.1 M sodium phosphate buffer pH 7.0 shall be used.
 - (D) The substrate acetylthiocholine iodide shall be used at a stock concentration of 10.1 mM in 0.1 M sodium phosphate buffer pH 8.0.
 - (E) The butyrylcholinesterase inhibitor quinidine hydrochloride monohydrate shall be used at a stock concentration of 6 mM in distilled deionized water.
 - (3) The acetylcholinesterase enzyme assay shall be performed within 15 minutes of preparation and the procedure for performing the assay shall be as follows:

- (A) Measure 0.2 mL whole blood and add into a 1.8 mL solution of deionized distilled water; mix thoroughly and keep the solution on ice.
 - (B) To 2.5 mL of the sodium phosphate buffer, add 0.02 mL of the blood solution, 0.1 mL of DTNB (0.32 mM final concentration) and 0.1 mL of quinidine (0.2 mM final concentration); mix thoroughly and allow to sit for 5 minutes.
 - (C) Add 0.3 mL acetylthiocholine iodide (1.0 mM final concentration) into the buffer/sample solution and mix thoroughly.
 - (D) Measure absorbance over the linear portion of the enzyme activity curve in the spectrophotometer.
- (4) The procedure for performing butyrylcholinesterase enzyme assay determination shall be as follows:
- (A) Physical separation of plasma or serum shall be performed.
 - (B) If samples are frozen, they shall be thawed at room temperature to assure homogeneity of the sample.
 - (C) To 2.6 mL of the sodium phosphate buffer, add 0.02 mL of the plasma or serum and 0.1 mL of DTNB (0.32 mM final concentration), mix thoroughly and allow to sit for 5 minutes.
 - (D) Add 0.3 mL acetylthiocholine iodide (1.0 mM final concentration) into the buffer/sample solution and mix thoroughly.
 - (E) Measure absorbance over the linear portion of the enzyme activity curve in the spectrophotometer.
- (5) A Buffer Blank containing 2.6 mL of sodium phosphate buffer, 0.3 mL of acetylthiocholine (1.0 mM final concentration), and 0.1 mL of DTNB (0.32 mM final concentration) and 0.02 mL of distilled deionized water shall be run with every batch of assays.
- (6) Reporting units shall be in International Units per milliliter of sample (IU/mL).
- (7) Baseline and follow up assays specified in 6728 (c)(2)(A) shall be conducted by the same laboratory method.
- (8) If an assay different from that described above is used, the method shall be shown comparable with the foregoing conditions and a conversion equation prepared. Results shall be reported in International Units per mL on both the original and the converted scale. The conditions to establish comparability shall be as described below.
- (A) Using personnel and procedures acceptable to the Department of Health Services (Business and Professions Code sections 1242,1243,1246,1269,2070; Health and Safety Code sections 120580, 1607), blood samples shall be collected from at least ten subjects.
 - (B) Blood from each subject shall be tested by serial dilution as specified in "Comparison of Acetylcholinesterase Assays Run under Conditions Specified by the Standard Ellman Method and Conditions Specified by a Commercial Cholinesterase Reagent Kit." HS-1752, July 30, 1998, Department of Pesticide Regulation, Worker Health and Safety Branch.
 - (C) Test dilutions shall be made at 100 percent and 50 percent of enzyme activity.
 - (D) Triplicate samples shall be run by both the reference and the alternative methods.
 - (E) Pearson product-moment correlation coefficient squared (r^2) shall be at least 0.9 between results of the alternative and reference methods.
- (9) Within five years from the effective date of amendment, the Director, in consultation with the Secretary for Environmental Protection, shall review this regulation to determine whether it should be retained, revised, or repealed.

Additional regulations of pesticides and pest control operations from Title 3 of the California Code of Regulations can be viewed at:

https://www.cdpr.ca.gov/docs/legbills/calcode/chapter_.htm

Reporting Requirements for ChE Testing Laboratories and Form Completion by Medical Supervisor (Health and Safety Code, section 105206)

This law relates to the reporting of ChE testing under the California Medical Supervision Program and to the registration of medical supervisors with OEHHA. It specifies what, by whom and to whom test results should be reported and gives OEHHA responsibility for setting up the registration process.

Note: Emboldening added to emphasize the subsections pertaining specifically to the medical supervisor.

Health and Safety Code section 105206:

(a) In order for an employer to satisfy his or her responsibilities for medical supervision of his or her employees who regularly handle pesticides pursuant to Section 6728 of Title 3 of the California Code of Regulations, the employer shall contract with a medical supervisor registered with the Office of Environmental Health Hazard Assessment (OEHHA).

(b) A laboratory that performs tests ordered by a medical supervisor shall report the information specified in subdivision (c) to the Department of Pesticide Regulation. Reports shall be submitted to the Department of Pesticide Regulation on, at a minimum, a monthly basis. For the purpose of meeting the requirements in subdivision (e), the reports shall be submitted via electronic media and formatted in a manner approved by the director. The Department of Pesticide Regulation shall share information from cholinesterase reports with the Office of Environmental Health Hazard Assessment (OEHHA) and the State Department of Public Health on an ongoing basis, in an electronic format, for the purpose of meeting the requirements of subdivisions (f) and (g).

(c) The laboratory shall report all of the following information in its possession in complying with subdivision (a):

(1) The test results in International Units per milliliter of sample (IU/mL).

(2) The purpose of the test, as indicated by the medical supervisor, as a cholinesterase test requested for an agricultural worker under medical supervision, and, if so, whether it is for a baseline, follow-up, or recovery test ordered to meet the requirements of Section 6728 of Title 3 of the California Code of Regulations or for the evaluation of suspected pesticide illness.

(3) The name of the person tested.

(4) The date of birth of the person tested.

(5) The name, address, and telephone number of the medical supervisor who ordered the analysis.

(6) The name, address, and telephone number of the laboratory.

(7) The date that the sample was collected from the person and the date the result was reported.

(8) Contact information for the person tested and his or her employer, if known and readily available.

(d) The registered medical supervisor ordering a cholinesterase test for a person pursuant to subdivision (a) shall note in the test order the name of the medical supervisor and the purpose of the test, pursuant to paragraph (2) of subdivision (c), and ensure that the person tested and the employer receive a copy of the cholinesterase test results and any recommendations from the

medical supervisor based upon those results within 14 days of the medical supervisor's receipt of the results. The medical supervisor shall report any worker with cholinesterase depression indicating pesticide exposure to the local health officer pursuant to Section 105200.

(e) All information reported pursuant to this section shall be confidential, as provided in Section 100330, except that the OEHHA, the Department of Pesticide Regulation, and the State Department of Public Health may share the information for the purpose of surveillance, case management, investigation, environmental remediation, or abatement with the appropriate county agricultural commissioner and local health officer.

(f) The OEHHA shall establish a procedure for registering and deregistering medical supervisors for the purposes of outreach and training and may establish reasonable requirements for performance. The OEHHA shall review the cholinesterase test results and may provide an appropriate medical or toxicological consultation to the medical supervisor. In addition to the duties performed pursuant to Section 105210, the OEHHA, in consultation with the Department of Pesticide Regulation and the local health officer, may provide medical and toxicological consultation, as appropriate, to the county agricultural commissioner to address medical issues related to the investigation of cholinesterase inhibitor-related illness.

(g) The Department of Pesticide Regulation and the OEHHA shall prepare and publicly post an update on the effectiveness of the medical supervision program and the utility of laboratory-based reporting of cholinesterase testing for illness surveillance and prevention by January 1, 2021.

(h) This section shall remain in effect only until January 1, 2021, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2021, deletes or extends that date.

General: Pesticide Illness Reporting (Health and Safety Code, section 105200)

This law relates to the reporting of known or suspected pesticide-related illness and injury by physicians and other health care providers to local health officers and from local health officers to government agencies (Department of Pesticide Regulation, OEHHA, and Department of Industrial Relations).

Any physician and surgeon who knows, or has reasonable cause to believe, that a patient is suffering from pesticide poisoning or any disease or condition caused by a pesticide shall promptly report that fact to the local health officer by telephone within 24 hours and by a copy of the report required pursuant to subdivision (a) of Section 6409 of the Labor Code within seven days, except that the information which is available to the physician and surgeon is all that is required to be reported as long as reasonable efforts are made to obtain the information.

Each local health officer shall immediately notify the county agricultural commissioner and, at his or her discretion, shall immediately notify the Director of Environmental Health Hazard Assessment of each report received and shall report to the Director of Pesticide Regulation, the Director of Environmental Health Hazard Assessment, and the Director of Industrial Relations, on a form prescribed by the Director of Environmental Health Hazard Assessment, each case reported to him or her pursuant to this section within seven days after receipt of the report.

The Office of Environmental Health Hazard Assessment shall designate a phone number or numbers for use by local health officers in the immediate notification of the office of a pesticide poisoning report. The office shall from time to time establish criteria for use by the local health officers in determining whether the circumstances of a pesticide poisoning warrants the immediate notification of the office.

In no case shall the treatment administered for pesticide poisoning or a condition suspected as pesticide poisoning be deemed to be first aid treatment.

Any physician and surgeon who fails to comply with the reporting requirements of this section or any regulations adopted pursuant to this section shall be liable for a civil penalty of two hundred fifty dollars (\$250). For the purposes of this section, failure to report a case of pesticide poisoning involving one or more employees in the same incident shall constitute a single violation. The Division of Occupational Safety and Health of the Department of Industrial Relations shall enforce these provisions by issuance of a citation and notice of civil penalty in a manner consistent with Section 6317 of the Labor Code. Any physician and surgeon who receives a citation and notice of civil penalty may appeal to the Occupational Safety and Health Appeals Board in a manner consistent with Section 6319 of the Labor Code.

Each local health officer shall maintain the ability to receive and investigate reports of pesticide poisoning at all times pursuant to Section 12982 of the Food and Agricultural Code.

General: Requirements on Physicians Regarding Occupational Injury and Illness (California Labor Code, section 6409)

This law relates to the reporting of Occupational Injury or Illness including Pesticide Poisoning (known or suspected).

Section 6409 Doctor's First Report of Occupational Injury or Illness

(a) Every physician as defined in Section 3209.3 who attends any injured employee shall file a complete report of every occupational injury or occupational illness to the employee with the employer, or if insured, with the employer's insurer, on forms prescribed for that purpose by the Division of Labor Statistics and Research. A portion of the form shall be completed by the injured employee, if he or she is able to do so, describing how the injury or illness occurred.

The form shall be filed within five days of the initial examination. Inability or failure of an injured employee to complete his or her portion of the form shall not affect the employee's rights under this code, and shall not excuse any delay in filing the form. The employer or insurer, as the case may be, shall file the physician's report with the Department of Industrial Relations, through its Division of Labor Statistics and Research, within five days of receipt. Each report of occupational injury or occupational illness shall indicate the social security number of the injured employee.

If the treatment is for pesticide poisoning or a condition suspected to be pesticide poisoning, the physician shall also file a complete report, which need not include the affidavit required pursuant to this section, with the Division of Labor Statistics and Research, and within 24 hours of the initial examination shall file a complete report with the local health officer by facsimile transmission or other means. If the treatment is for pesticide poisoning or a condition suspected to be pesticide poisoning, the physician shall not be compensated for the initial diagnosis and treatment unless the report is filed with the employer, or if insured, with the employer's insurer, and includes or is accompanied by a signed affidavit which certifies that a copy of the report was filed with the local health officer pursuant to the requirements of this section.

(b) As used in this section, "occupational illness" means any abnormal condition or disorder caused by exposure to environmental factors associated with employment, including acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.