

# Cholinesterase Testing Protocols for Healthcare Providers

## When to Test?

### Cholinesterase-Inhibiting Pesticides

Test if working with Class I or Class II organophosphates (OPs) or OPs and N-methyl-carbamates for greater than a total of 30 hours in 30 consecutive days.

### N-Methyl-Carbamates

If only working with N-methyl-carbamates, cholinesterase testing is not likely to be beneficial.

## Baseline

### Baseline Determination

Obtain baseline measures prior to working with cholinesterase-inhibiting pesticides. When obtaining the baseline, ensure that cholinesterase-inhibiting pesticides has not been handled in the immediate 30 days prior to testing.\*

### Second Baseline

A second baseline is recommended for improved precision but not essential. Wait to test at least three days after the baseline, but no longer than 14 days (OEHHA, 2017). If a second baseline is obtained, average the two values. For accuracy, ensure no pesticide exposures during this time period.

**Establish baselines annually.**

### Working Baseline

Working baselines (baselines that are established when a 30-day period free of OPs exposure is not possible) are likely to increase false negatives. Perform a second baseline after halting exposure (the longest practicable exposure-free period available is recommended, with a one-week exposure-free period at a minimum).

If values differ by more than 10%, obtain a third baseline. The highest value should be used as the baseline.

## Testing

### Test Types

Measure both *acetylcholinesterase* (red blood cell cholinesterase; RBC ChE) and *butyryl cholinesterase* (plasma cholinesterase; Plasma ChE). Both RBC ChE and Plasma ChE tests are recommended. If only performing one test, do Plasma ChE.

### Laboratory Services

Use the same laboratory and the same methodology for all testing so that results may be accurately compared.

## Post-Exposure Testing

Washington state recommends testing each time a worker exceeds or reaches 30 hours of exposure within any 30-day period after the baseline is established or after last post-exposure test. California state recommends testing each time a worker exceeds or reaches 6 days of exposure within a sliding scale 30-day period.

## Medical Removal

Remove worker from cholinesterase-inhibiting pesticide exposure if their RBC ChE is less than 70%, and/or their Plasma ChE is less than 60% of the baseline.

## Level to Return to Handling

### Return to Handling

Return to handling when RBC ChE and Plasma ChE are both greater than or equal to 80% of baseline.

### Retest for Return to Work

Days to repeat test is determined by degree of reduction in cholinesterase activity or may consider testing weekly.

**For RBC ChE:** (% depression – 20) / 0.83  
= number of days to repeat test

**For Plasma ChE:** (% depression – 20) / 1.2  
= number of days to repeat test

## Review of Handling Practices

Review pesticide handling practices when test results are less than 80% of baseline.

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*Revised on 02/16/2023 by Steven Kirkhorn, MD, MPH and Matthew Keifer, MD, MPH, National Farm Medicine Center external scientific advisor.*

## Resources

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\*Handling of pesticides refers to tasks such as mixing, loading, transferring or applying pesticides; handling open containers of pesticides; acting as a flagger; cleaning, handling, adjusting or repairing pesticide equipment; or assisting with the application of pesticides.

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