



CHOLINESTERASE TESTING AND SCREENING

A. What is Cholinesterase?

Cholinesterase is an enzyme produced by the body that is needed for the central nervous system to function properly.

Acetylcholine is a chemical that sends signals from nerve endings.

Cholinesterase breaks down acetylcholine.

Absence of cholinesterase or excess acetylcholine leads to confusion of the body's nervous system.

Symptoms (*can occur within minutes to hours.*)

- Headaches
- Dizziness
- Nausea
- Abdominal pain
- Anxiety
- Muscle twitching or weakness
- Shortness of breath
- Diarrhea
- Constricted pupils
- Convulsions
- Coma

B. Why is cholinesterase so important?

Certain pesticides contain cholinesterase inhibitors

- Organophosphate pesticides
- Carbamate pesticides

Insects also naturally produce cholinesterase

- Breaking down of cholinesterase confuses pest's nervous system and causes them to die. (*The same mechanism that can be hazardous to humans.*)
- It is the mechanism for insect control for plants/crops

People who work with these pesticides should have their cholinesterase levels monitored

- Farmers who work with organophosphate or carbamate pesticides
- People applying pesticides
- Harvest/pickers who are exposed to residue
- Commercial pesticide applicators
- People who mix/load chemicals
- Anyone who has been accidentally exposed to high amounts of organophosphate or carbamate pesticides
 - ✓ In this case an immediate medical exam is necessary
 - ✓ Weekly testing is appropriate until symptoms are gone



C. Cholinesterase Testing/Surveillance

Toxicity

- Amount of exposure needed to cause harm
- Hazard levels are predetermined through testing animals using specific doses through.
- Lethal doses are printed on labels of pesticides
- Risks of pesticide use are minor or severe depending on
 - ✓ Frequency of Exposure
 - ✓ Concentration
- Can be cumulative over time (*small doses over time can lead to toxicity.*)

Baseline Testing

- Determines the normal level of cholinesterase in the body
- What is “normal” varies from person to person
- Baselines are determined by drawing blood
- Needs to be conducted prior to exposure
 - ✓ Before starting a new job
 - ✓ Spring
 - (*Note: for mid-west farmers spring is usually the time the body has resumed normal levels prior to pesticide use from the previous spraying season by remaking the cholinesterase that was previously destroyed.*)
 - ✓ At least 60 days prior to last exposure

Why should baselines be done?

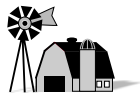
- Periodic testing allows physicians to compare data
 - ✓ If symptoms occur
 - ✓ Establishes exposure level later in the season
 - ✓ Helps determine whether protective equipment and management practices are appropriate

Decreases in baseline cholinesterase levels

- 20% decrease indicates a farmer should reexamine management practices (*e.g. protection in the form of clothes, respirator.*)
- 50% decrease is typically amount needed for symptoms to present
 - ✓ Farmers should discontinue exposure
 - ✓ Symptoms are reversible
 - When exposure is stopped &
 - Cholinesterase is back to baseline level
- 90% decrease is considered severe poisoning and can be lethal.

Factors that may produce an unusually low baseline

- Genetic trait
- Liver disease
- Certain medications (*It is important to discuss any of these factors with your doctor when undergoing a physical, which should accompany the baseline testing.*)



D. Other Preventive Measures

Become familiar with the types of pesticides you work with

Save labels of the pesticides you work with

Wear appropriate equipment during mixing, loading, application or handling of insecticides

- Clothing that provides an effective barrier to pesticide sprays and dusts
- Respirators that protect the lungs from hazardous chemicals
- Protective Eyewear
 - ✓ Splash goggles or full face shields
 - ✓ Should be fitted and cleaned
 - ✓ Never wear contact lenses
- Hand protection
 - ✓ Unlined rubber or plastic gloves
 - ✓ Never wear leather
 - ✓ Should not be tight as to limit dexterity
 - ✓ Should not be too big to interfere with work
 - ✓ Wear sleeves outside the gloves to prevent chemicals from seeping in or allowing direct exposure to skin
 - ✓ Wash gloves after use
 - ✓ Dispose of old gloves
- Foot protection
 - ✓ Neoprene or nitrile boots prevent exposure
 - ✓ Do not wear leather boots
 - ✓ Wear pant legs outside the boot