Pesticide Hazards and First Aid

Chapter 5

National Pesticide Applicator Certification Core Manual

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CHAPTER 5

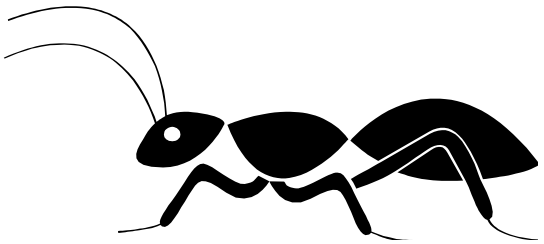
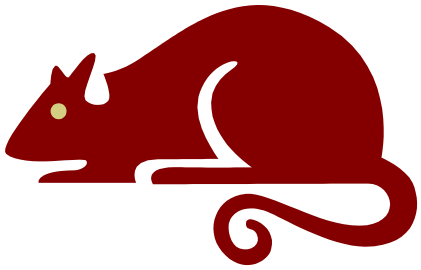
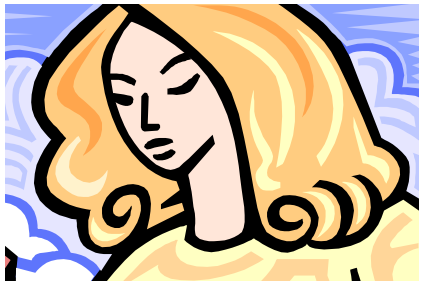
Pesticide Hazards & First Aid

This module will help you:

- Know the different types of effects pesticides can have on your health
- Understand signal words
- Know the routes of exposure
- Recognize symptoms of exposure
- Know when and how to give first aid

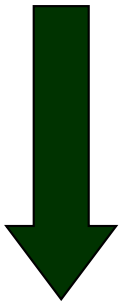
Pesticides and Humans

- Insects, rodents, and humans have similar nervous, circulatory, and respiratory systems, so pesticides can affect people too!

- Health effects - short- or long-term
- Physical and chemical risks - explosive or combustible

HAZARD = Toxicity x Exposure



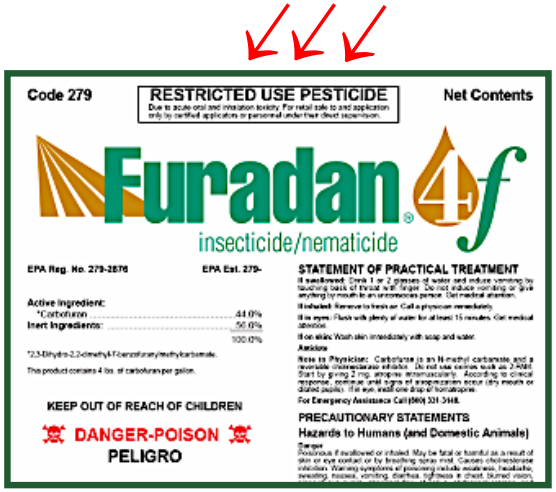
risk; the potential for injury

the capacity of a pesticide to cause injury

the risk of a pesticide contacting or entering the body

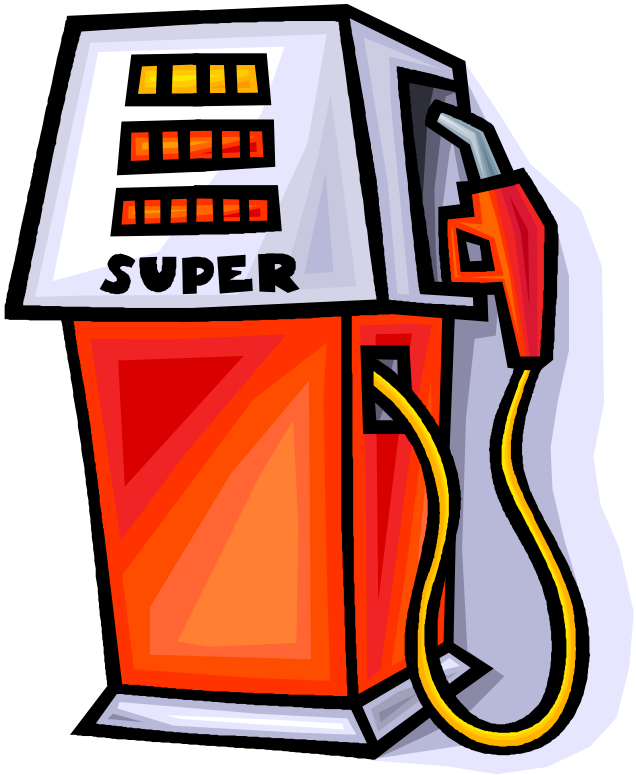
Hazard

- Higher toxicity = greater hazard
- Lower toxicity = less hazard



- Higher exposure= greater hazard
- Lower exposure= less hazard

High toxicity, Low exposure risk



Low toxicity, High exposure risk

Hazards Increase…

- when mixing and loading the concentrate
- with a very high single exposure
- after many exposures over time

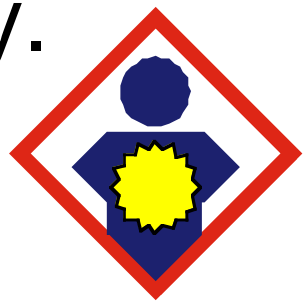
Reduce Hazards!!

- By using least toxic pesticides
- Wearing personal protective equipment

HAZARD = Toxicity x Exposure

Potential Harmful Effects

- **Local effects:** injury at the point of contact. Skin discoloration and irritation such as itching, redness, rashes, blisters, burns. Swelling, stinging, burning of eyes, nose, mouth or throat.
- **Systemic effects:** poisoning effects that occur at sites other than the entry point into the body.



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Potential Harmful Effects

- **Systemic effects:** poisoning effects that occur at sites other than the entry point into the body.
  - Cholinesterase inhibition (nerve damage)
  - Impairment of the blood's clotting ability
  - Some cancers
  - Reproductive problems
  - Impaired metabolism
  - Hormonal effects
  - Damage to organs such as kidneys or liver

Potential Harmful Effects

- **Allergic effects:** occur in some people in reaction to certain substances. Can be from local (contact) or systemic exposure.
  - Dermatitis (blisters, hives)
  - Itching of eyes 
  - Illness
  - Asthma-like symptoms
  - Life-threatening shock.
  - Entire body may be affected

Systemic Effects

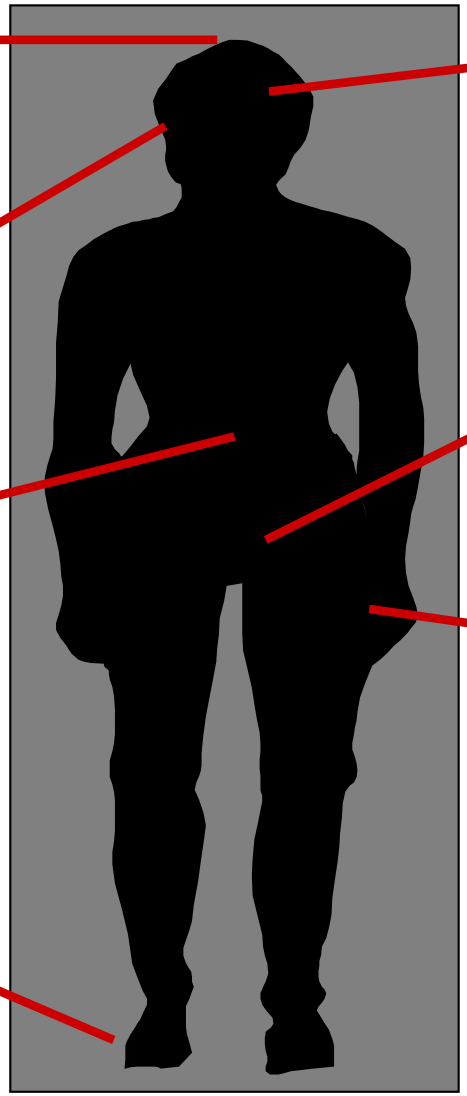
- From pesticides that target animals
  - Insecticides: nervous system
  - Rodenticides: circulatory system
- Insecticide symptoms: nausea, vomiting, diarrhea, headache, dizziness, weakness, excessive sweating, tearing, chills, thirst, chest pain, breathing difficulty, body aches & cramps

Routes of Entry: Skin or dermal

Contact injury to the skin is the most common form of pesticide poisoning!

97% of all body exposure during spraying is by skin contact!

Ability to absorb pesticides



Greater dermal absorption

- Warm, moist areas: groin, armpits, head, neck
- Cuts, abrasions, and rashes
- Pesticide formulations affect absorption

Least absorbed

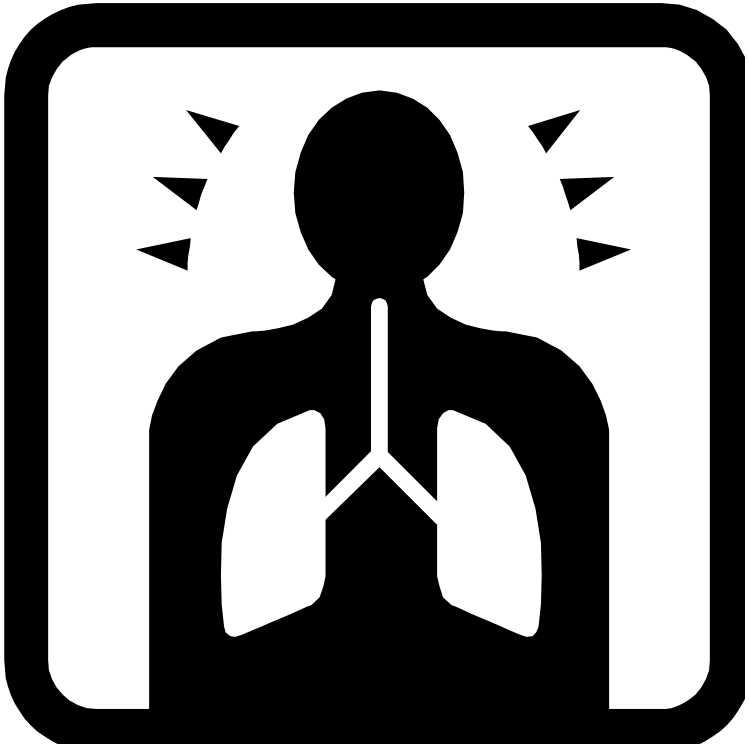
Most absorbed

Routes of Entry:

Lungs (inhalation)

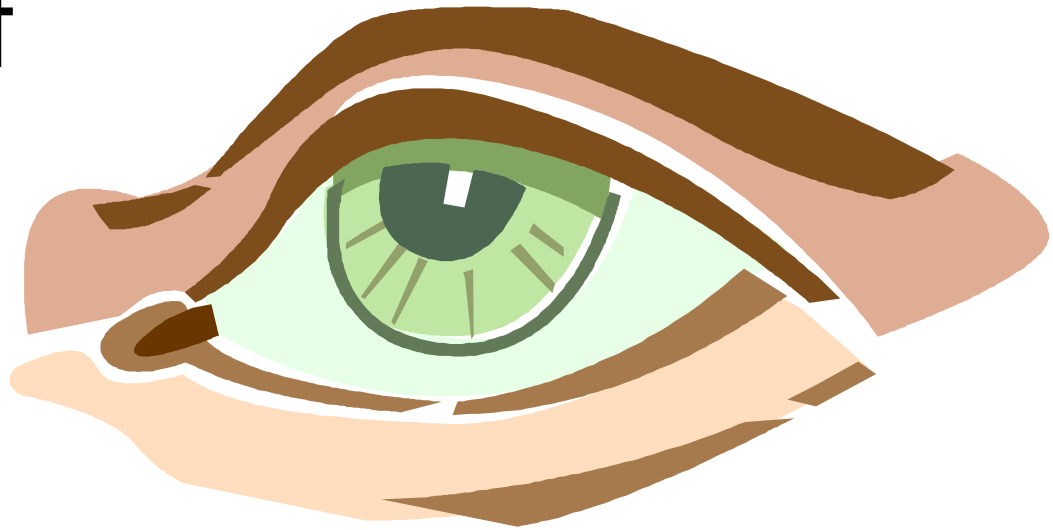
Inhalation exposure can occur:

- When using
  - Wettable powders
  - Dusts
  - Gases, vapors
  - Sprays
- While mixing & loading
- During applications



Routes of Entry: Eyes

Eyes are able to absorb surprisingly large amounts of chemical



Routes of Entry: Oral

Wash your hands!

…before eating, drinking smoking, or going to the bathroom at breaks!!

Possible Harmful Effects from Pesticides

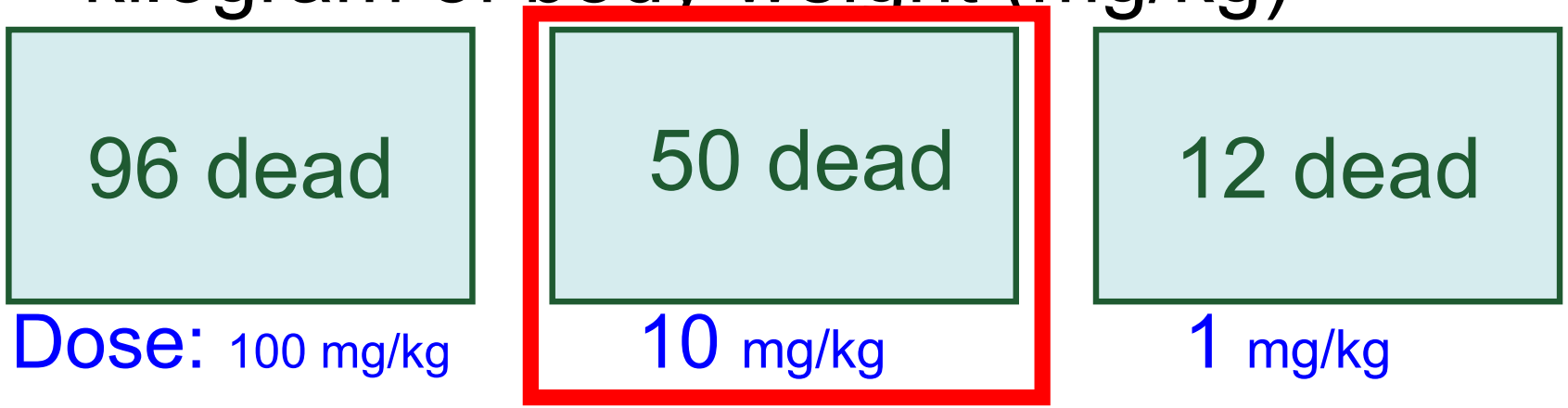
- Acute effects
- Chronic effects
- Delayed effects

Acute effects…

- Occur from a single exposure
- Develop within 24 hrs of exposure
- Any effect is measured
- Toxicity usually expressed as LD_{50} or LC_{50}

LD_{50} and LC_{50}

- **LD_{50}** = the *dose* of a substance that kills 50% of a population of test animals
  - measured in milligrams of toxicant per kilogram of body weight (mg/kg)



- **LC_{50}** = *concentration* of a substance in air or water that kills 50% of a test population, measured in parts per million

Table 5.1 Toxicity Categories

Signal Word & Symbol	Toxicity Level & Class	LD_{50} Oral (mg/kg)	LD_{50} Dermal (mg/kg)	LC_{50} Inhalation (mg/l)	Contact Injury Concern	Toxicity Concern
DANGER—POISON/PELIGRO **Skull & Crossbones**	Highly toxic, Hazard Class I	Trace to 50	Trace to 200	Trace to 0.2	Signal word based on oral, dermal, or inhalation toxicity.	Very low dose could kill a person (a few drops to 1 teaspoon).
DANGER/PELIGRO	Highly toxic, Hazard Class I				Corrosive—permanent or severe skin, eye, or respiratory damage.	Based on the corrosive or irritant properties of the product.
WARNING/AVISO	Moderately toxic, Hazard Class II	50 to 500	200 to 2,000	0.2 to 2	Moderate skin, eye, or respiratory damage.	Small to medium dose could cause death, illness, or skin, eye, or respiratory damage (1 teaspoon to 1 ounce).
CAUTION	Slightly toxic, Hazard Class III	500 to 5,000	2,000 to 20,000	2 to 20	Mild skin, eye, or respiratory irritation.	Medium to large dose could cause death, illness, or skin, eye, or respiratory damage (1 ounce to 1 pint or 1 pound).
CAUTION or no signal word	Hazard Class IV	Greater than 5,000	Greater than 20,000	Greater than 20	Slight concern for skin, eye, or respiratory injury.	Slight to none (over 1 pint or 1 pound).

DANGER-POISON
PELIGRO

Fatal if swallowed. May cause blindness if swallowed. May be fatal if inhaled or absorbed through eyes. Causes irreversible eye damage. Do not get in eyes, on skin, or on clothing. Do not breathe vapors or spray mist.

RESTRICTED USE PESTICIDE

Due to Acute Toxicity

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification..

Bayer CropScience

Guthion® Solupak 50%

Wettable Powder Crop Insecticide

IN WATER SOLUBLE PACKETS

For effective economical insect control.

ACTIVE INGREDIENT:

O,O-Dimethyl *S*-[(4-oxo-1,2,3-benzotriazin-3(*4H*)-yl)methyl]phosphorodithioate	50%
INERT INGREDIENTS:	50%
	100%

EPA Reg. No. 264-733 EPA Est. No. 3125-MO-1

DEALERS SHOULD SELL IN ORIGINAL PACKETS ONLY

Keep water soluble packets in this container and store in a cool dry place, but not below freezing (32F). Protect from heat. Keep away from open flame. Do not heat. Entire inner packets dissolve in water. After opening outer bag, drop the required unopened inner packets into spray tank as directed. Do not excessively handle water soluble packet or expose it to moisture, since this may cause breakage

STOP – Read the label before use.

KEEP OUT OF REACH OF CHILDREN

DANGER POISON

PELIGRO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle.
(If you do not understand the label, find someone to explain it to you in detail.)

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER

Fatal if swallowed. May be fatal if inhaled. Harmful if absorbed through skin. Causes moderate eye irritation. Do not breathe dust or spray mist. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco. Remove contaminated clothing and wash clothing before reuse.

AMINE 4

2,4-D WEED KILLER

For Selective Broadleaf Weed Control in
Certain Crops, Turf and Non-Crop Areas.

ACTIVE INGREDIENT:	
*Dimethylamine salt of 2,4-Dichloro-phenoxyacetic acid	46.5%
INERT INGREDIENTS:	53.5%
TOTAL	100.0%

*Equivalent to 38.6% 2,4-D acid or 3.74 pounds per gallon.
*Isomer specific by AOAC Method No. 6.275-6.279 (13th Ed.)

KEEP OUT OF REACH OF CHILDREN

DANGER — PELIGRO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand this label, find someone to explain it to you in detail.)

(See Below for Additional Precautionary Statements)

EPA REG. NO. 34704-120

EPA EST. NO. _____

NET CONTENTS 2½ GAL. (9.46 L)

IHT 10P01

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

DANGER — PELIGRO

Corrosive. Causes irreversible eye damage. Do not get in eyes or on clothing. Harmful if swallowed, inhaled, or absorbed through skin. Avoid contact with skin. Avoid breathing spray mist. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse. Do not contaminate water used for irrigation, domestic or spray purposes.

Personal Protective Equipment:

Applicators and other handlers must wear: Long-sleeved shirt and long pants, waterproof gloves, shoes plus socks and protective eye-wear. Follow manufacturer's instructions for cleaning/maintaining

USER SAFETY RECOMMENDATIONS

Users should:

Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet.

Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

Remove PPE immediately after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

FIRST AID

If in eyes:	• Hold eye open and rinse slowly and gently with water for 15 –20 minutes. • Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. • Call a poison control center or doctor for treatment advice.
If swallowed:	• Call a poison control center or doctor immediately for treatment advice. • Have a person sip a glass of water if able to swallow. • Do not induce vomiting unless told to do so by the poison control center or doctor. • Do not give anything by mouth to an unconscious person.
If on skin or clothing:	• Take off contaminated clothing. • Rinse skin immediately with plenty of water for 15-20 minutes. • Call a poison control center or doctor for treatment advice.
If Inhaled:	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. • Call a poison control center or doctor for further treatment advice.

FOR A MEDICAL EMERGENCY INVOLVING THIS PRODUCT CALL: 1-800-228-5635, EXT. 136, OR CALL COLLECT, 612-851-8180. EXT. 136.

Corrosive. Eye Damage

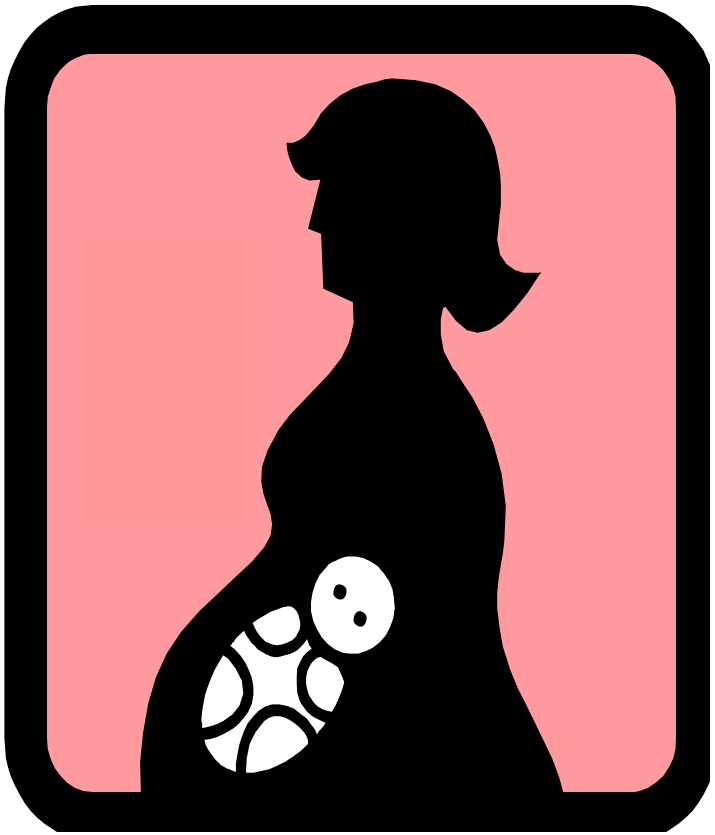
LD_{50} and LC_{50} have limitations because…

- they only measure death rates, not less serious acute effects
- they do not translate directly to humans
- they only measure effects of a single exposure, not multiple exposures

Chronic Effects

Low dose exposures over an extended period of time

- Birth defects
- Toxicity to a fetus
- Production of tumors
- Genetic changes
- Blood disorders
- Nerve disorders
- Reproductive effects



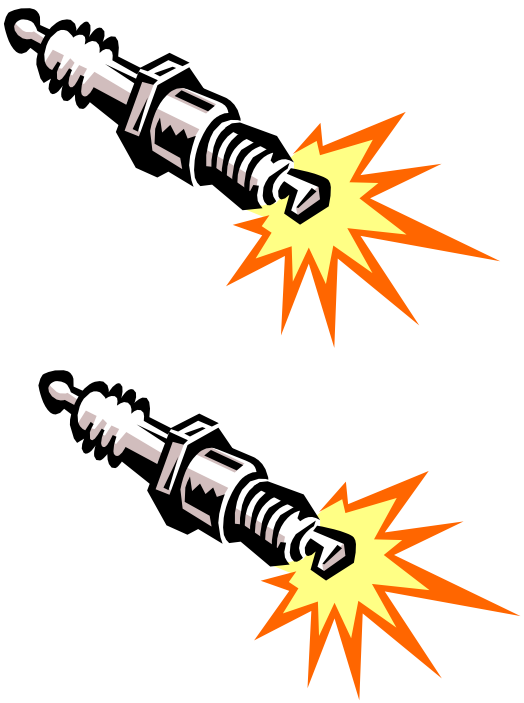
Delayed Effects

- After 24 hours
- After repeated exposures

For example, organophosphates and carbamate INSECTICIDES…

Organophosphates and carbamate insecticides **inhibit** cholinesterase

- Over-exposure may decrease available cholinesterase nerve enzyme
- Cholinesterase is the nernous system “off switch”. If inhibited, nerves continuously fire
- Over-stimulating muscles, glands, and organs



Blood Test:

Monitor your cholinesterase levels if you apply organophosphate and carbamate insecticides

Familiar Organophosphates (OP) Insecticides

- Diazinon
- Acephate
- Chlorpyrifos (Dursban)
- Malathion
- Metasystox-R

Familiar Carbamates Insecticides

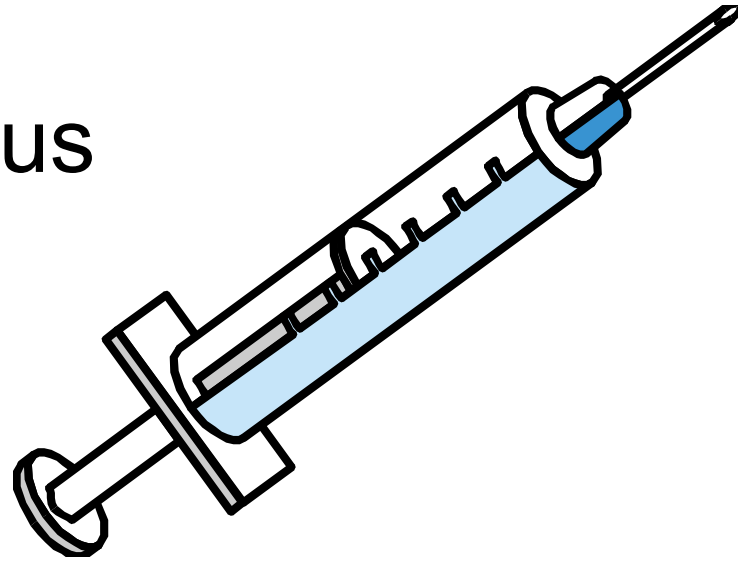
- Carbaryl (Sevin)
- Methomyl (Lannate)
- Aldicarb (Temik)
- Carbofuran (Furadan)

Symptoms from Organophosphate & Carbamate Insecticide Exposure

- mild: fatigue, headache, giddiness, sweating, tearing, dizziness or blurred vision, cramps, nausea, vomiting, diarrhea
- moderate: numbness, changes in heart rate, general muscle weakness, difficulty breathing and walking, pinpoint pupils, excessive salivation
- severe: convulsions and coma

Antidotes for OP and Carbamate Poisoning

- Organophosphates:
  - Atropine sulfate, plus
  - Protopam chloride (2-PAM)
- Carbamates
  - Atropine sulfate ONLY
- **NEVER USE ANTIDOTES TO PREVENT EXPOSURE!!**



Recognize Symptoms of Exposure

Varies according to the pesticide and the individual

rash, headache, nausea, dizziness

If Exposure Occurs, Administer First Aid

- **Dilute the pesticide**
  - **On skin:** remove contaminated clothing, wash skin, gently dry and loosely cover
  - **In eyes:** wash *across* eyes for 15 minutes
  - **If inhaled,** get victim to fresh air and laid down
  - **If ingested, induce vomiting EXCEPT…** and administer activated charcoal in water
  - **DO NOT USE syrup of ipecac– ineffective!**

DO NOT Induce Vomiting If…

- victim is unconscious or convulsing
- petroleum products (kerosene, gasoline, oil) were involved
- emulsifiable concentrates used
- corrosive poisons, or strong acids or bases were ingested

Seek medical attention

Take the label

Keep extra copies of the label (and MSDS) in your vehicle and office for emergencies!!

Post Emergency Numbers

- **American Association of Poison Control Centers**

  1-800-222-1222 (staffed 24 hours)

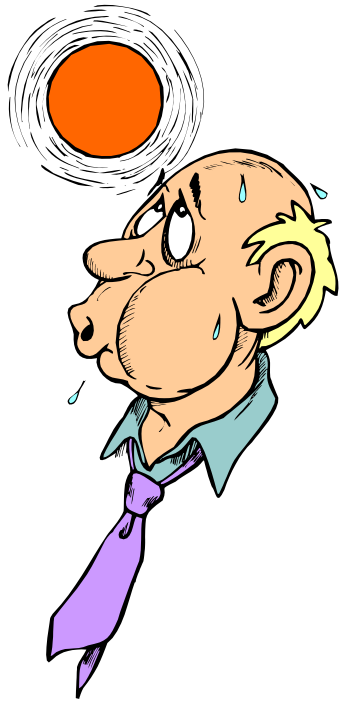
- **National Poison Control Center**

  1-888-426-4435

- **National Pesticide Information Center (NPIC)**

  1-800-858-7378, npic.orst.edu

Heat Stress

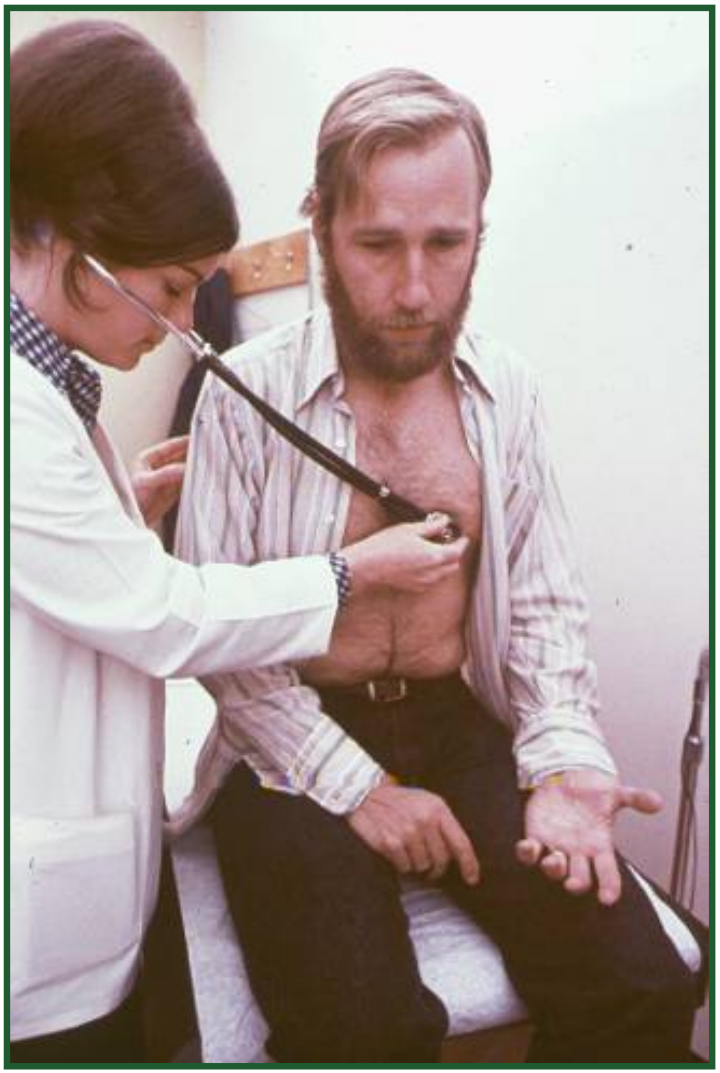


- **Caused by heat**, NOT pesticide exposure
- **Wearing PPE increases risk**
- **Symptoms**:
  - Fatigue, exhaustion, muscle weakness
  - Dizziness, fainting
  - Clammy or hot, dry skin
  - Altered behavior: confusion, slurred speech,
  - Severe thirst, dry mouth
  - Heavy sweating or lack of sweating

See page 85

See a doctor annually

- Take precautions
- Get regular exercise
- Eat a balanced diet
- Drink lots of water
- Wash hands & face regularly
- Keep food away from application equipment



CHAPTER 5

Summary

- **Hazard = Toxicity x Exposure**
- Contact, Systemic, or Allergic effects
- Routes of entry: skin, eyes, mouth, lungs
- Use least toxic pesticides
- Always use PPE!
- Know symptoms of acute & chronic exposure
- Know first aid!

CHAPTER 5

Q1. The capacity of a pesticide to cause short-term (acute) or long-term (chronic) injury is referred to as its:

A. Toxicity
B. Exposure
C. Hazard


RESTRICTED USE PEST
ACUTE INHALATION TOXICITY OF HIGHLY TOXIC
KEEP OUT OF REACH OF CHILDREN
DANGER/PELIGRO-POISON
PhosFum
FUMIGATION TABLETS

CHAPTER 5

Q1. The capacity of a pesticide to cause short-term (acute) or long-term (chronic) injury is referred to as its:

A. Toxicity
B. Exposure
C. Hazard

CHAPTER 5

Q2. HAZARD is the measure of

1. Cholinesterase levels
2. LD_{50} and LC_{50} values
3. Oral, skin, eye, and inhalation exposure
4. The capacity of a pesticide to cause injury

A. 1 and 2 only	C. 1 and 4 only
B. 1 and 3 only	D. 2 and 3 only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CHAPTER 5

Q3. The most common way pesticides enter the body is by:

A. Eyes

B. Lungs

C. Mouth

D. Skin

CHAPTER 5

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