CHAPTER 5

# Pesticide Hazards and First Aid

Chapter 5

National Pesticide Applicator Certification Core Manual

WASHINGTON STATE UNIVERSITY EXTENSION

CHAPTER 5

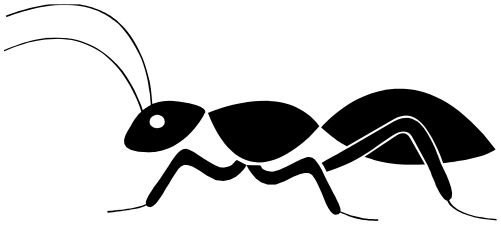
# Pesticide Hazards & First Aid

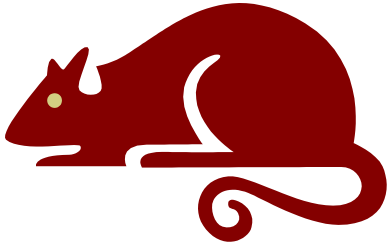
This module will help you:

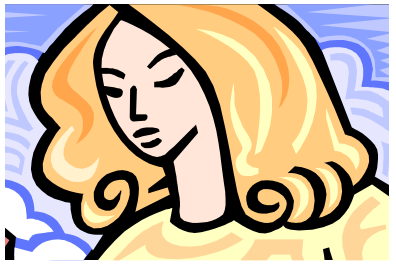
- Know the different types of effects pesticides can have on your health
- Understand signal words
- Know the routes of exposure
- Recognize symptoms of exposure
- Know when and how to give first aid

# Pesticides and Humans

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

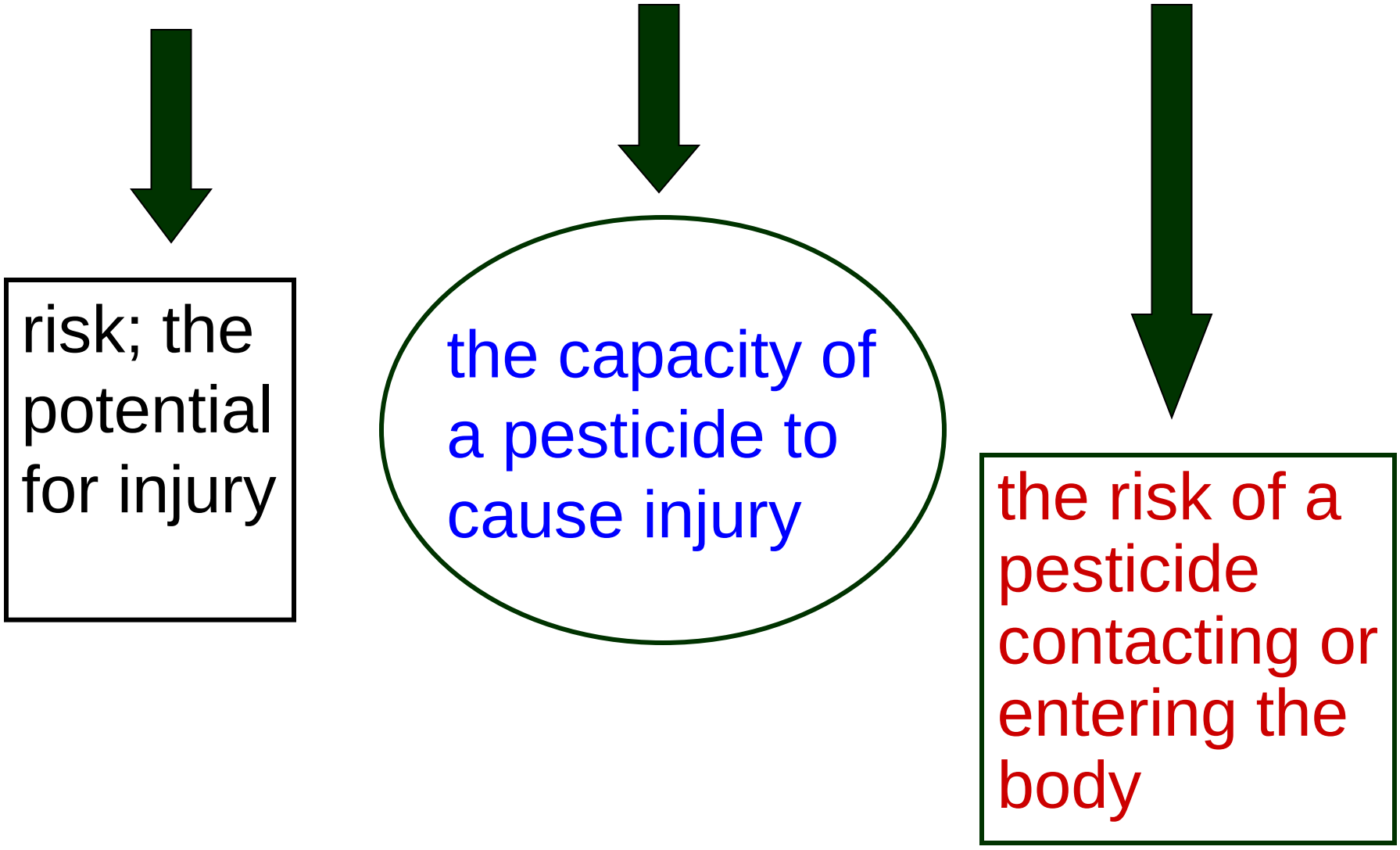






- Health effects -  short- or long-term
- Physical and chemical risks - explosive or combustible

# HAZARD = Toxicity x Exposure



# Hazard

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


Code 279

RESTRICTED USE PESTICIDE

Due to acute oral and inhalation toxicity. For retail sale to and application only by certified applicators or personnel under their direct supervision.

Net Contents

Furadan 4F

insecticide/nematicide

EPA Reg. No. 279-2876 EPA Est. 279-

Active Ingredient:
*Carbofuran ..... 44.0%
Inert Ingredients: ..... 56.0%
100.0%

*2,3-Dihydro-2,2-dimethyl-7-benzofuranyl methylcarbamate.

This product contains 4 lbs. of carbofuran per gallon.

KEEP OUT OF REACH OF CHILDREN

DANGER-POISON

PELIGRO

STATEMENT OF PRACTICAL TREATMENT

**If swallowed:** Drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. Do not induce vomiting or give anything by mouth to an unconscious person. Get medical attention.

**If inhaled:** Remove to fresh air. Call a physician immediately.

**If in eyes:** Flush with plenty of water for at least 15 minutes. Get medical attention.

If on skin: Wash skin immediately with soap and water.

Antidote

Note to Physician: Carbofuran is an N-methyl carbamate and a reversible cholinesterase inhibitor. Do not use oximes such as 2-PAM. Start by giving 2 mg. atropine intramuscularly. According to clinical response, continue until signs of anticholinization occur (dry mouth or dilated pupils). If in eye, instill one drop of homatropine.

For Emergency Assistance Call (800) 331-3148.

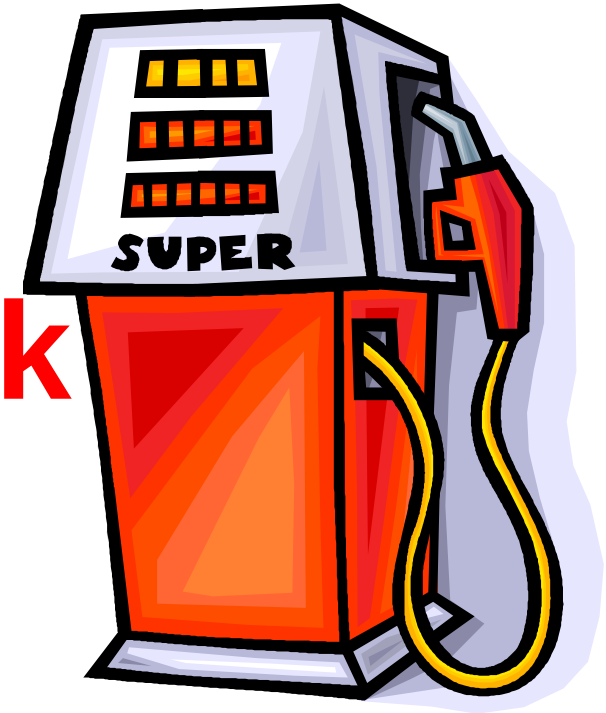
PRECAUTIONARY STATEMENTS

Hazards to Humans (and Domestic Animals)

Danger

Poisonous if swallowed or inhaled. May be fatal or harmful as a result of skin or eye contact or by breathing spray mist. Causes cholinesterase inhibition. Warning symptoms of poisoning include weakness, headache, sweating, nausea, vomiting, diarrhea, tightness in chest, blurred vision,

**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

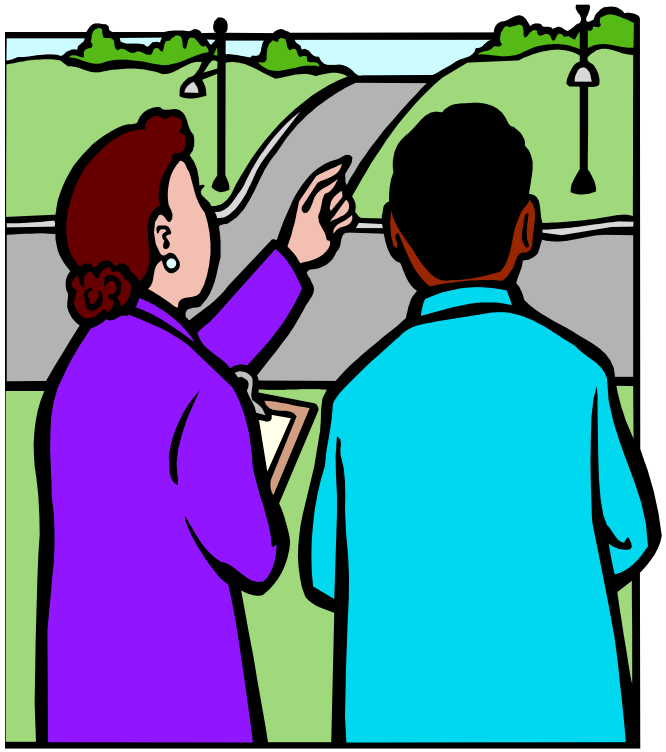
# Reduce Hazards!!

- By using least toxic pesticides
- Wearing personal protective equipment

**HAZARD = Toxicity x Exposure**

# *Attitude* Makes a Difference

- Read and follow the label carefully
- Be aware of the people and the environment in and around treated areas



# Poisoning Effects

- Contact
- Systemic
- Allergic

# Contact Effects

- Skin irritation (dermatitis): itching, redness, rashes, blisters, burns
- Eyes: swelling, stinging, burning
- Nose, mouth, throat irritation
- Typical of herbicides, fungicides and other products

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

# 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

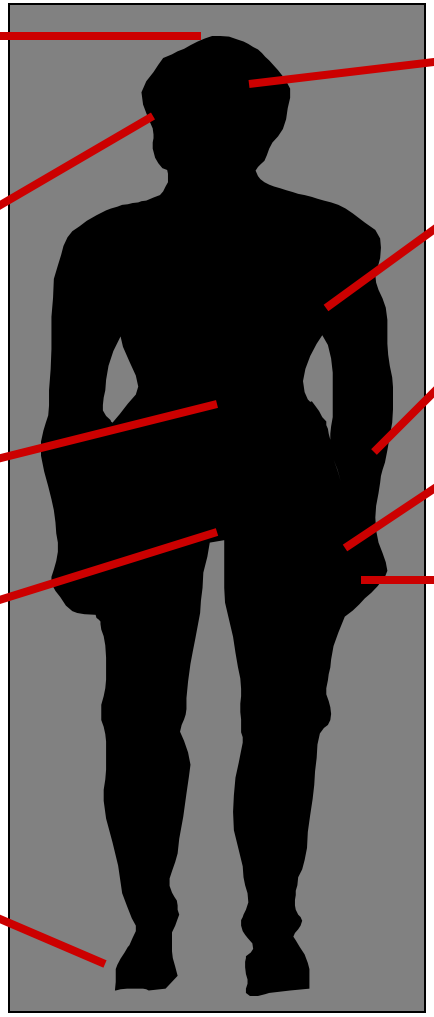
# Allergic Effects

- Contact or Systemic
- Dermatitis, blisters, hives
- Life-threatening shock
- Red or itchy eyes
- Respiratory discomfort, asthma

# Routes of Entry:  Skin (Dermal)

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

# Different parts of the body vary in their ability to absorb pesticides.



Scalp 32%

Ear Canal 40%

Abdomen 18%

Genital Area 100%

Ball of Foot 13%

Forehead 36%

Armpit 64%

Forearm 9%

Palm 12%

Back of Hand 21%

Percent Dose Absorbed
Chemical -parathion
Maibach 1974

# Greater dermal absorption

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

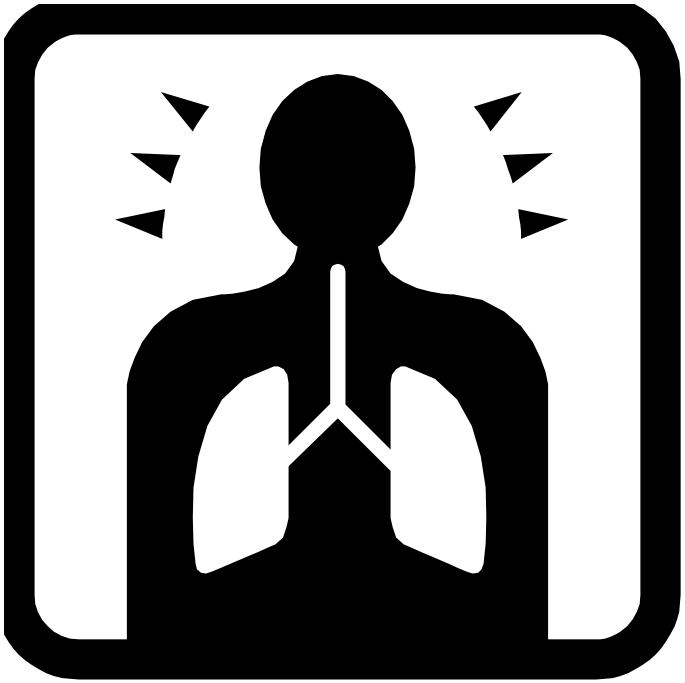
**Least absorbed**


**Most absorbed**

# Routes of Entry: Lungs (inhalation)

## Inhalation exposure can occur:

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

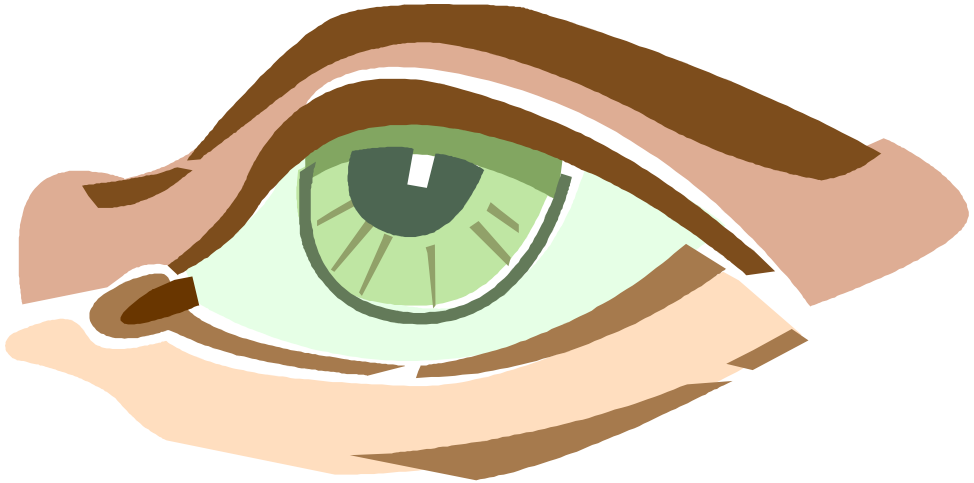


# Protect yourself from inhalation exposure!

# Fumigants are active as gases!

# 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

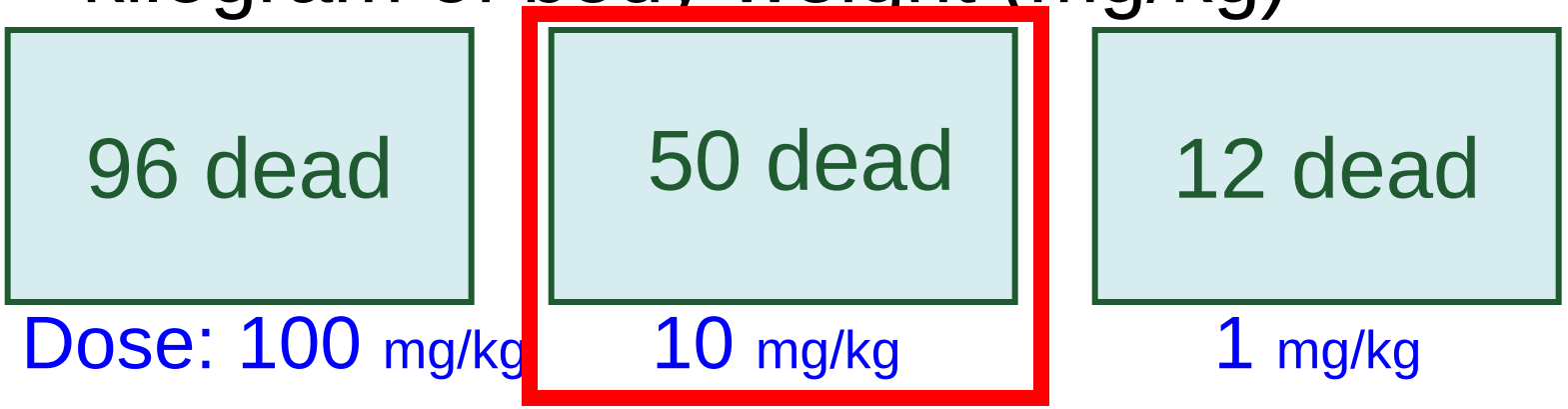
- Acute effects
- Chronic effects
- Delayed effects

# 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

# Signal Words

| Signal Word | Category | Toxicity | Oral $LD_{50}$ |
|---|---|---|---|
| Danger-Poison<br>Peligro  | I | High | 0-50 mg/kg |
| Danger/Peligro | I | High - Eye or skin damage concerns greater than acute lethal toxicity | |
| Warning/Aviso | II | Moderate | 50-500 mg/kg<br>or skin/eye |
| Caution | III | Slight | >500 mg/kg<br>or skin/eye |

# DANGER - POISON

- **Highly toxic by any route of entry**


**PRECAUTIONARY STATEMENTS**
**HAZARDS TO HUMANS**
**AND DOMESTIC ANIMALS**

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(4*H*)-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.

# DANGER PELIGRO

- **can cause severe eye damage or skin irritation**

**DANGER**
**PELIGRO**

**PRECAUTIONARY STATEMENTS**
**HAZARDS TO HUMANS**
**AND DOMESTIC ANIMALS**
**DANGER**

**Causes irreversible eye damage.....**

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

# WARNING AVISO

- Moderately toxic

**WARNING**
**AVISO**

**PRECAUTIONARY STATEMENTS**
**HAZARDS TO HUMANS**
**AND DOMESTIC ANIMALS**
**DANGER**

**Causes moderate eye damage and/or skin irritation.....**

21154Z3-1/CG

Roundup ORIGINAL™

HERBICIDE

## Complete Directions for Use

EPA Reg. No. 524-445

AVOID CONTACT WITH FOLIAGE, GREEN STEMS, EXPOSED NON-WOODY ROOTS OR FRUIT OF CROPS, DESIRABLE PLANTS AND TREES, SINCE SEVERE INJURY OR DESTRUCTION MAY RESULT.



2000-1

Read the entire label before using this product.

Use only according to label instructions.

Read "LIMIT OF WARRANTY AND LIABILITY" before buying or using. If terms are not acceptable, return at once unopened.

OTHERWISE) SHALL BE THE PURCHASE PRICE PAID BY THE USER OR BUYER FOR THE QUANTITY OF THIS PRODUCT INVOLVED, OR, AT THE ELECTION OF THIS COMPANY OR ANY OTHER SELLER, THE REPLACEMENT OF SUCH QUANTITY, OR, IF NOT ACQUIRED BY PURCHASE, REPLACEMENT OF SUCH QUANTITY. IN NO EVENT SHALL THIS COMPANY OR ANY OTHER SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR SPECIAL DAMAGES.

Buyer and all users are deemed to have accepted the terms of this LIMIT OF WARRANTY AND LIABILITY which may not be varied by any verbal or written agreement.

## PRECAUTIONARY STATEMENTS

### Hazards to Humans and Domestic Animals

Keep out of reach of children.

### WARNING! AVISO!

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.)

CAUSES SUBSTANTIAL BUT TEMPORARY EYE INJURY.

HARMFUL IF SWALLOWED OR INHALED.

Do not get in eyes or on clothing.

Avoid breathing vapor or spray mist.

**FIRST AID: IF IN EYES,** immediately hold eyelids open and flush with plenty of water for at least 15 minutes. Get medical attention.

**IF INHALED,** remove individual to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

**IF SWALLOWED,** this product will cause gastrointestinal tract irritation. Immediately dilute by swallowing water or milk. Get medical attention. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

### Personal Protective Equipment (PPE)

**Applicators and other handlers must wear:** long-sleeved shirt and long pants, shoes plus socks, and protective eyewear. Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them

# Caution

- slightly toxic

**CAUTION**
**PRECAUCION**

**PRECAUTIONARY STATEMENTS**
**HAZARDS TO HUMANS**
**AND DOMESTIC ANIMALS**
**CAUTION**

**Avoid contact with eyes, skin or clothing.**

MICRO-FLO
THE PLANT HEALTH AND PROTECTION COMPANY

# KUMULUS® DF

fungicide/acaracide

| | |
|---|---|
| **ACTIVE INGREDIENT:** | |
| Sulfur | 80% |
| **INERT INGREDIENTS:** | 20% |
| TOTAL | 100% |

## KEEP OUT OF REACH OF CHILDREN

## CAUTION

**FIRST AID**

**If Swallowed:** Call a Poison Control Center or doctor immediately for treatment advice. Have 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 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 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.

**PRECAUTIONARY STATEMENTS**

**Hazards to Humans and Domestic Animals**

Harmful if swallowed. Avoid breathing spray mist. Avoid contact with eyes, skin, and clothing.

# Not Just for Pesticides!

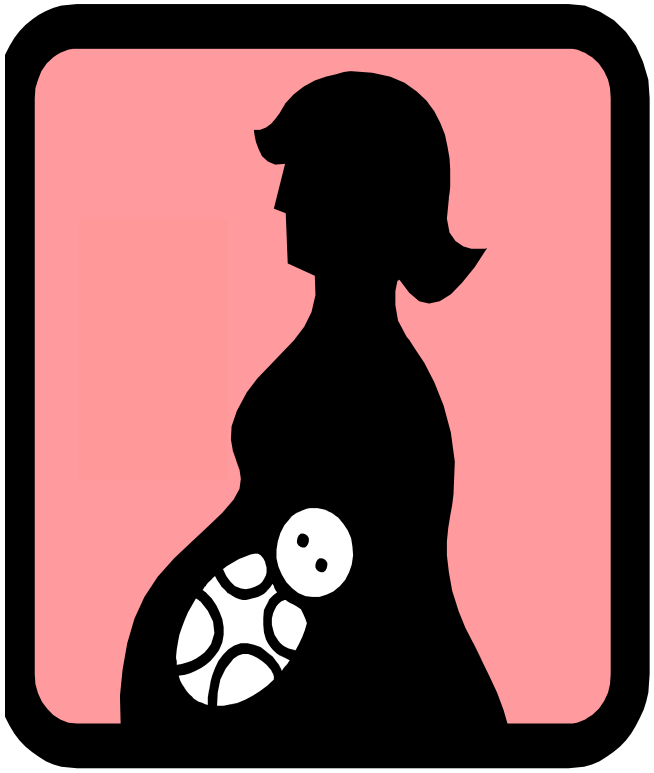
# $LD_{50}$ and $LC_{50}$ have limitations because…

- 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



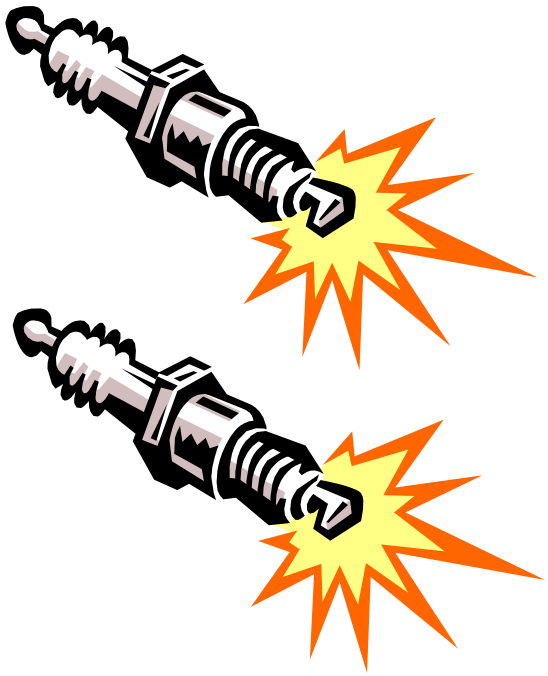
# Delayed Effects

- 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



# Familiar Organophosphates (OP) Insecticides

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

# Familiar Carbamates Insecticides

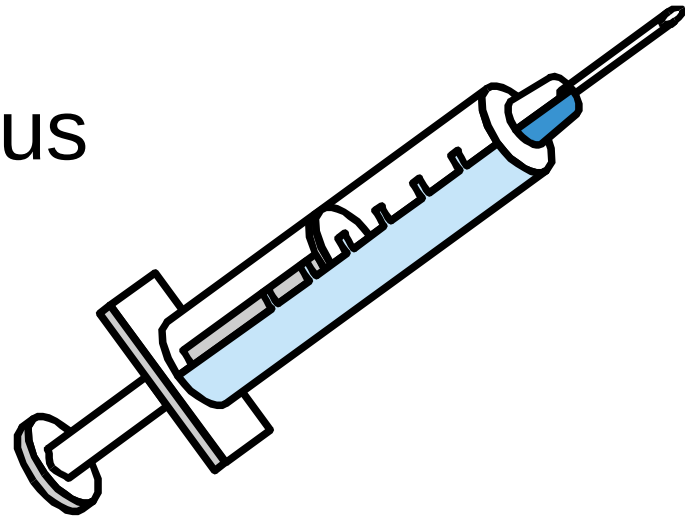
- Carbaryl (Sevin)
- Methomyl (Lannate)
- Aldicarb (Temik)
- Carbofuran (Furadan)

# Symptoms from Organophosphate and 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!!**



**Blood Test:**

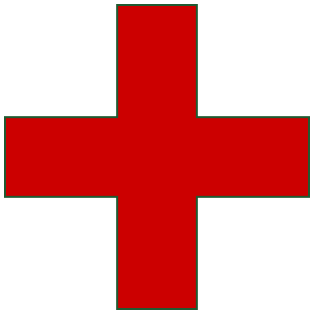
Monitor your cholinesterase levels if you apply organophosphate and carbamate insecticides

# 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!

**National Poison Control Center**

**1-800-222-1222**

**National Pesticide**

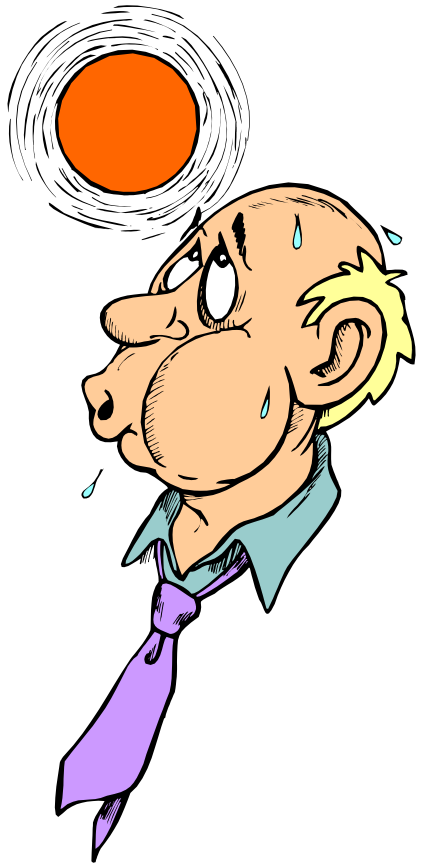
**Information Center (NPIC)**

**1-800-858-7378**

**npic.orst.edu**

# Heat Stress

- Caused by heat, NOT pesticide exposure
- Wearing PPE increases risk
- **Symptoms** (similar)**:**
  - Fatigue, dizziness, altered behavior
  - Clammy skin or hot-dry skin
  - Headache, nausea, chills
  - Severe thirst
  - Heavy sweating or lack of sweating



# See a doctor annually!

- Take precautions
- Get regular exercise
- Eat a balanced diet
- Drink lots of water
- Wash hands & face regularly
- Keep food, etc. 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!

Q1. The ability of a pesticide to cause harm from extended exposures to low doses, years later, is termed:

A. Acute Toxicity
B. Behavioral Toxicity
C. Chronic Toxicity
D. Lactic Toxicity

## 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 |

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

A. Eyes

B. Lungs

C. Mouth

D. Skin

CHAPTER 5

# Acknowledgements


- Washington State University Urban IPM and Pesticide Safety Education Program authored this presentation

- Illustrations were provided by Nevada Dept. of Agriculture, University of Maryland, University of Missouri-Lincoln, Virginia Tech., Washington Dept. of Agriculture, Washington State University


WASHINGTON STATE UNIVERSITY
World Class. Face to Face.

WASHINGTON STATE UNIVERSITY EXTENSION

CHAPTER 5

# Acknowledgements


- Presentation was reviewed by Beth Long, University of Tennessee; Ed Crow, Maryland Dept. of Agriculture; Jeanne Kasai, US EPA; and Susan Whitney King, University of Delaware.
- Narration was provided by Becky Hines, Washington State University Urban IPM & Pesticide Safety Education


WASHINGTON STATE UNIVERSITY EXTENSION

CHAPTER 5

*Support for this project was made possible through EPA Office of Pesticide Program cooperative agreements with the Council for Agricultural, Science and Technology, and the National Association of State Departments of Agriculture Research Foundation. The views expressed herein are those of the authors and do not necessarily represent the views and policies of the EPA.*

CAST

NASDARF

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON STATE UNIVERSITY EXTENSION