



FLORIDA
**MASTER
GARDENER**

Pesticides:

Selection, Use,
and Safety

Learning Objectives:

The slide features a decorative header with a light green background. At the top right, there are silhouettes of several spiky plants, possibly dandelions or similar weeds. Below this, a horizontal band of stylized grass blades spans the width of the slide. The main content area has a solid light green background.

- Define the term “pesticide.”
- Understand the various ways pesticides are classified.
- Know how to select and use a pesticide in a safe, effective, and environmentally-friendly way according to the label.
- Recognize and interpret the parts of a pesticide label.



Part I

INTRODUCTION TO PESTICIDES & PESTICIDE CLASSIFICATION

What is a Pesticide?

- Pesticide - Any product that kills or repels a pest.
- Pest - An organism which has a detrimental effect on humans, domestic animals, living spaces, or the environment.



Plant Pests and Pesticides

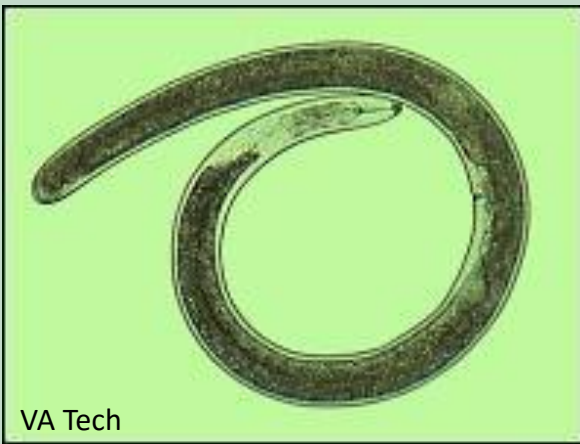


University of Florida

Insects - Insecticides



Weeds - Herbicides



VA Tech

Nematodes - Nematicides



Diseases - Fungicides/Bactericides

Plant Pests and Pesticides



Spider Mites - Miticides



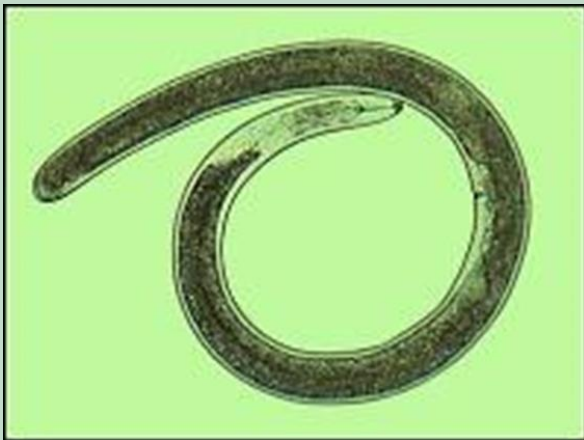
Snails & Slugs - Molluscicides



Nuisance Wildlife - Repellents

Plant Pests are not always visible!

But their damage usually is.



UF



UF

However, many things can damage plants...

For example:

- Drought
- Flooding
- Frost/freeze
- Wind
- Chemical injury
- Mechanical injury



So, *first* confirm that a pest is truly the problem...



Remember...pesticides are the last line of defense in an IPM program

- **IPM** – Integrated Pest Management: the combined use of **cultural, biorational, biological, & chemical** methods for acceptable, economic pest control with minimum effect on non-target organisms and the environment.
- Rely on non-pesticide approaches whenever possible.




Pesticides are Classified by:



- **Target Pest:** Insects=insecticides; Weeds=herbicides, etc.
- **How they Work:** Contact poison, stomach poison, systemic, protectant, etc.
- **Application Method:** Foliar, soil drench, etc.
- **Formulation:**
 - EC - Emulsifiable concentrates
 - Solutions - Pre-mixed; Ready-to use
 - Dusts, Granules, Baits
 - Powders - Wettable or soluble
 - Flowables
 - Aerosols, etc.
- **Toxicity:** a pesticide's ability to cause damage
- **Use:** General or Restricted
- Synthetic or Organic
- **MoA** – Mode of Action

Toxicity Classification



Signal Word	Toxicity	LD50*(mg/kg)	Lethal Dose (adult/oral)
DANGER/ POISON 	Highly Toxic/ Acute Poisoning	0-50	Few drops to 1 tsp
WARNING	Moderately Toxic	50-500	1 tsp to 1 ounce
CAUTION	Low Toxicity	500-5,000	1 ounce to 1 pint or pound
CAUTION or NO SIGNAL WORD	Relatively Non- toxic	>5000	More than 1 pint or pound

*LD50 – Lethal dosage in 50% of the test animals; low numbers = high toxicity

Use Classification



General Use (GU) or Unclassified

Product may be used in and/or around the home by anyone; no license required

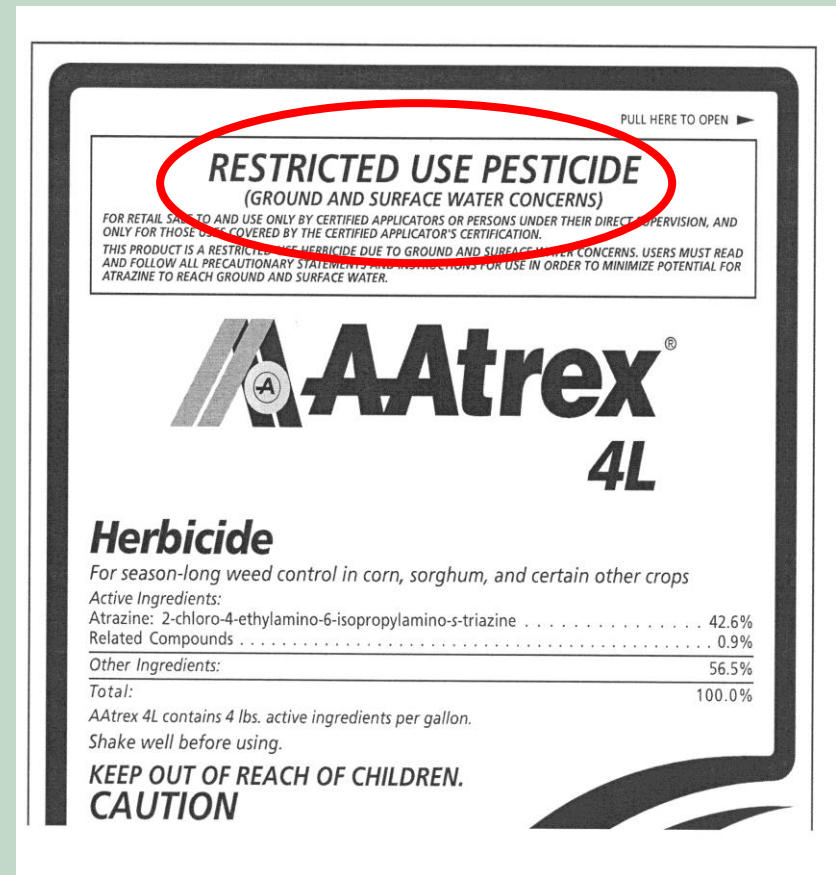


Use Classification

- **Restricted Use - RU**

Product may have adverse effects on people or the environment.

RU pesticides are intended for ***certified pesticide applicators*** only. A license is required to buy or apply RU products.



Synthetic or “Organic” Classification

- **Synthetic** – Man-made, tend to be longer lasting
- **Organic***
 - Plant derived/Botanical
 - Mineral based
 - Soaps and Oils
 - Microbials



**See Natural Products for Managing Landscape and Garden Pests in Florida – EDIS ENY 350*

MoA – Mode of Action

Classification

- **MoA** describes the way a pesticide attacks some biological process within the pest.
For example:
 - Certain herbicides target photosynthesis; others mimic plant hormones, etc.
 - Certain insecticides attack insect nerve cells; others disrupt development, etc.



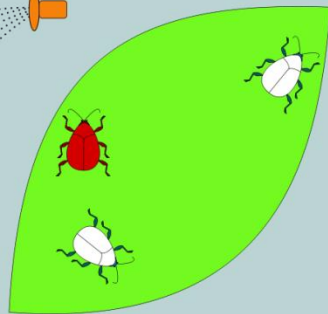
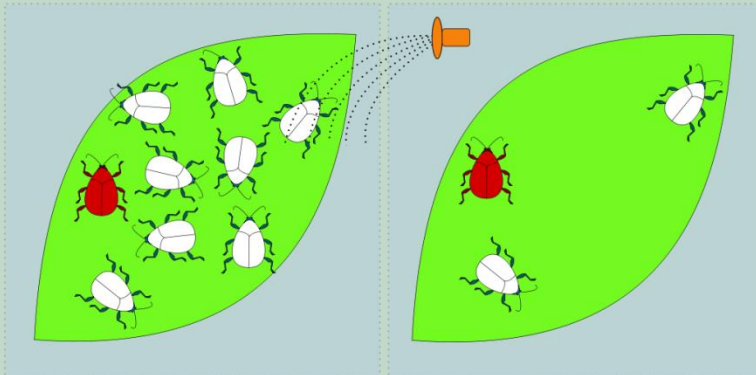
Avoid Pesticide Resistance



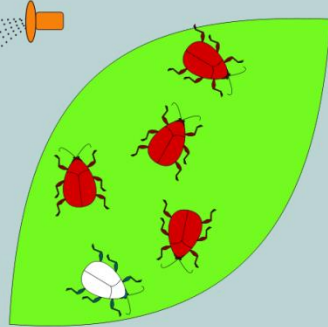
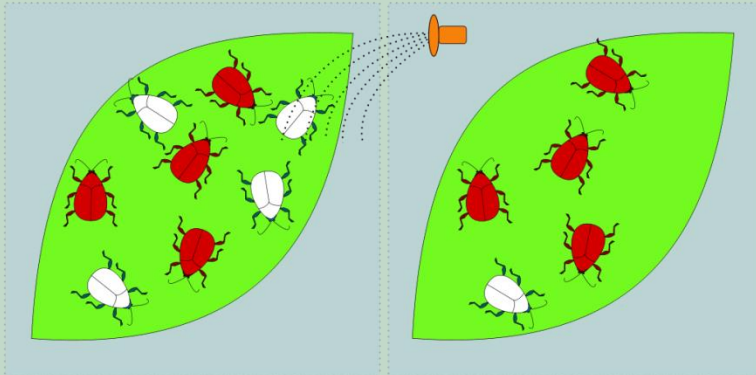
Before pesticide application

After pesticide application

First generation




Later generation



- Pesticide applications rarely kill 100% of the target.
- Survivors pass resistant genes to their offspring.
- *Repeated use of the same pesticide creates resistance.*
- *Rotate Modes of Action (MoA).*

MoA – Mode of Action

- MoAs are color-coded according to the physiological functions affected. (Blue color below denotes nerve toxins).
- MoAs are also numbered. For resistance management, rotate MoAs by group number, not color. (Currently, 30 MoA groups exist)



1	ACETYLCHOLINESTERASE (ACHE) INHIBITORS
A	CARBAMATES
B	ORGANOPHOSPHATES

For more info see: <http://www.irac-online.org/>

Example: Both products kill aphids the same way, but have different MoA group numbers



Contains: Cyfluthrin
(Pyrethroid – Nerve
Action - MoA Group #3)



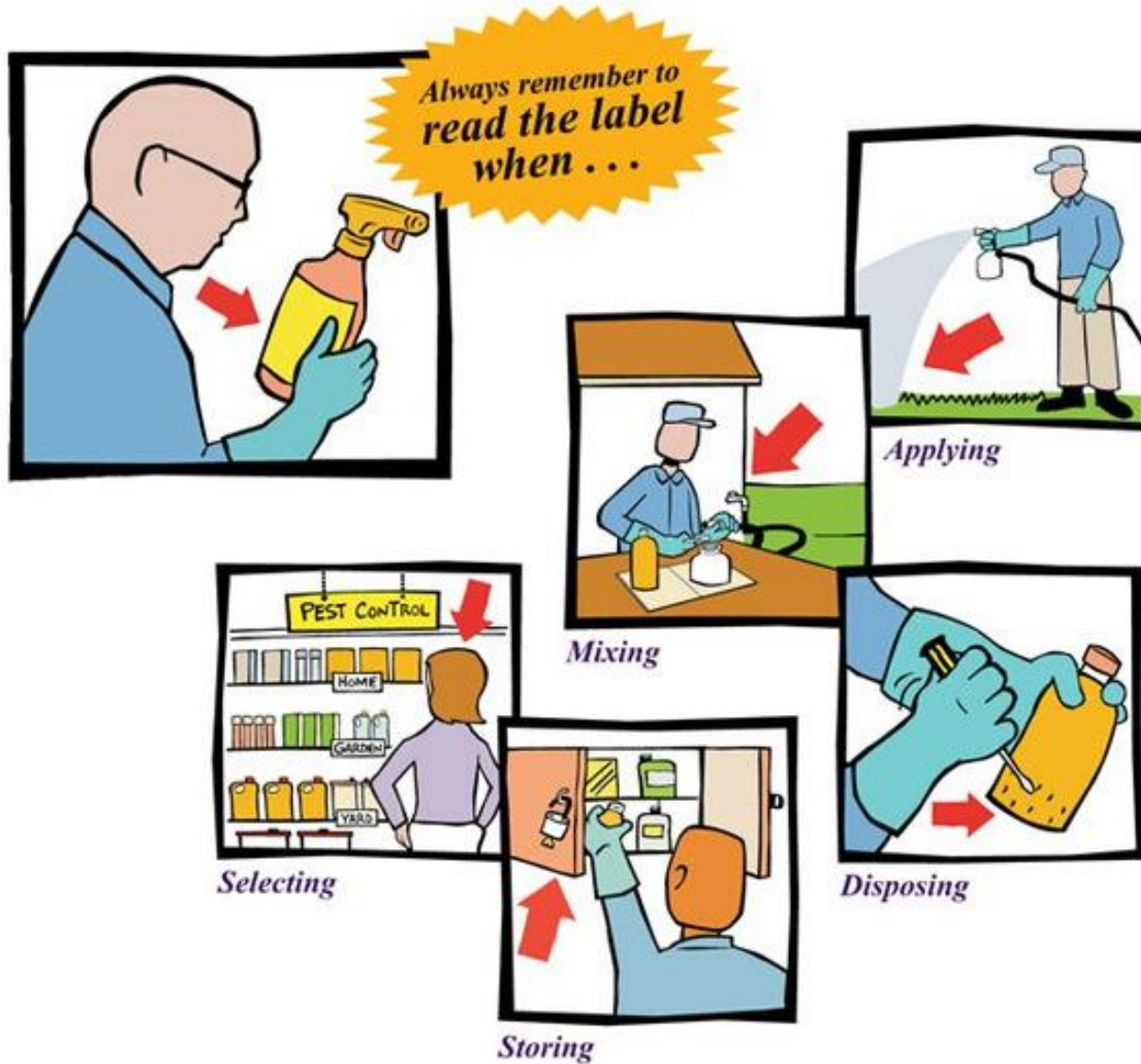
Contains: Acetamidiprid
(Neonicotinoid – Nerve
Action - MoA Group #4)



Part II

THE PESTICIDE LABEL

The Pesticide Label



ALWAYS READ THE LABEL



Before you:

- Buy a pesticide
- Mix a pesticide
- Apply a pesticide
- Store a pesticide
- Dispose of a pesticide container

The label is the law!

Every product sold must have an attached label.

ALWAYS READ THE LABEL

It provides information on:

- Where and on what it can be applied
- Toxicity
- Hazards
- PPE-Protection
- How to mix/apply
- First Aid
- DTH-Days to Harvest
- Storage/disposal
- ...and more!



Pesticide Labels



Pesticide Selection



- The “crop” and site *must* be listed.
- The pest does *not* have to be listed; but the product may not control it.
- ***Consider:***
 - Toxicity (to humans, pets, wildlife, beneficials, environment)
 - Amounts and Ease of use (pre-mixed?)
 - Equipment required (ready-to-use?)

Pesticide Selection

- *Compare* active ingredients – a.i.



Pesticide Selection

Brand Names Can be Confusing!

- The brand name may not include the name of the a.i.
- Similar brand names may not have the same a.i.
- The same a.i. may be sold with different brand names.
- The same brand name may contain different percentages of a.i.



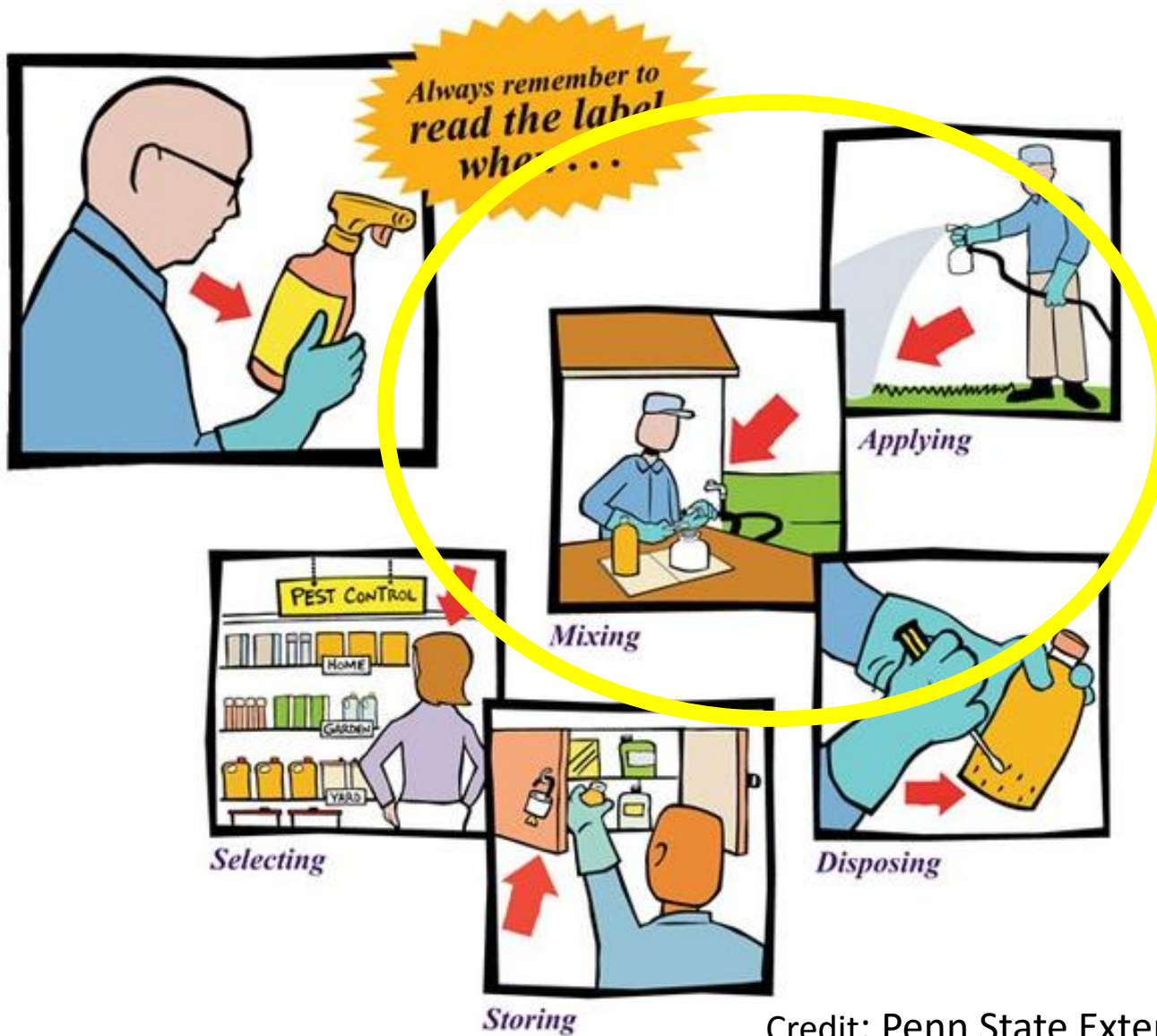
Pesticide Selection

Avoid wasting unused product:

- Buy small quantities - only what you need
- Share with a neighbor
- Purchase ready-to-use/pre-mixed



Pesticide Labels



Mixing and Applying

- Under-dosing = poor results
- Over-dosing:
 - expensive, wasteful, & *illegal*
 - potential for environmental pollution
 - can damage plants



Mixing and Applying



Damaged leaf from pesticide drift

Minimize Drift

- Wind less than 5 mph
- Spray at a low pressure and use a large nozzle opening.
- Safest spray times: early morning or late evening (less wind & lower temperatures).

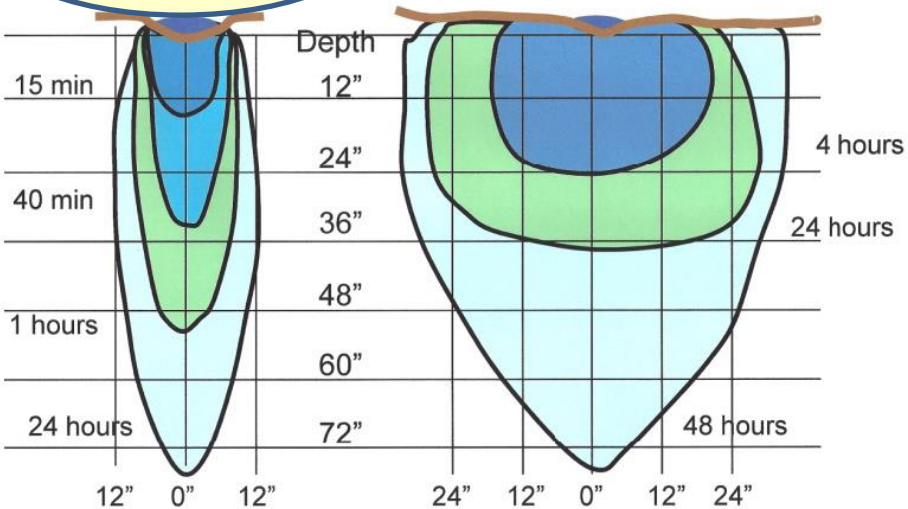
Mixing and Applying

LEACHING: Pesticide moves down through soil into groundwater.

RUNOFF: Pesticide moves with storm water into surface water.

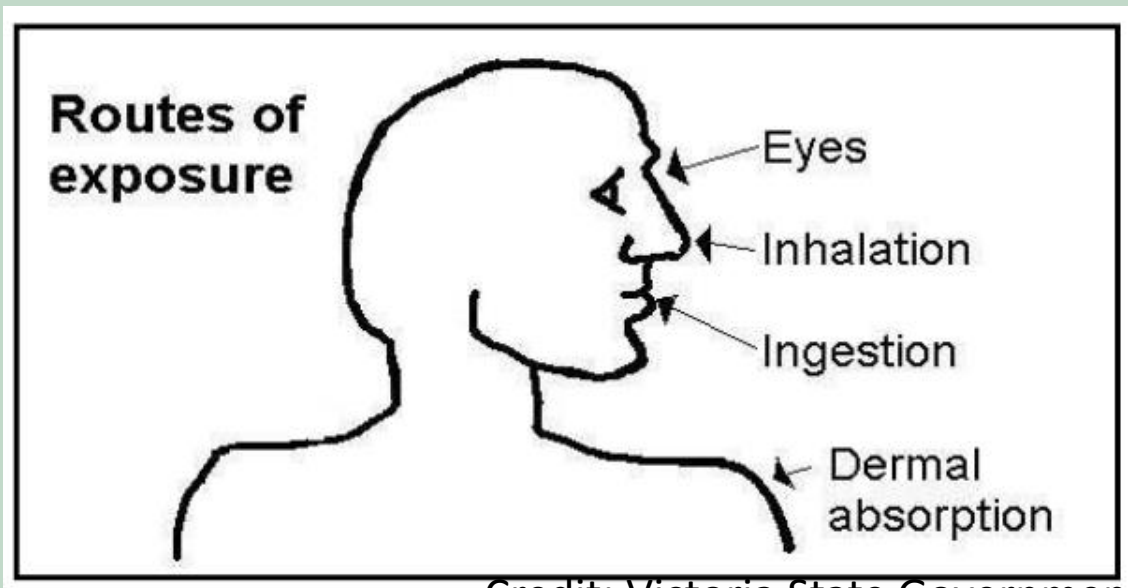
Large Pore Space

Gravitational Pull
Sandy Soil

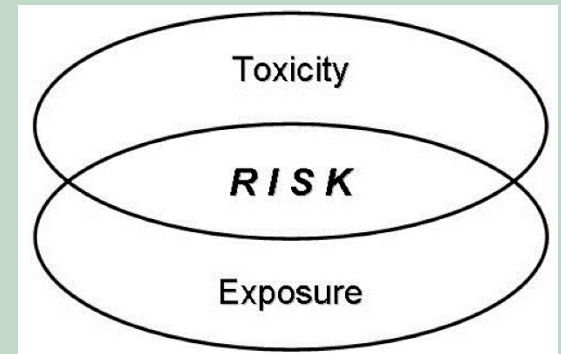


Mixing and Applying

Exposure: chemical contact with the body



Credit: Victoria State Government



Acute – exposure and reaction is severe and immediate

Chronic – delayed reaction due to repeated low-level exposure

Allergic – immune system response to chemicals

Mixing and Applying



- Majority of home exposures are **dermal**.
 - Note label directions for skin protection
 - Wear gloves that are “chemically resistant” (not just waterproof).



Mixing and Applying



- **PPE (personal protective equipment):**
 - Long-sleeved shirt & long pants
 - Face shields, safety glasses/goggles (not regular eye- or sunglasses)
 - Socks and shoes
 - Launder exposed clothes separately
 - Other PPE (as indicated on the label)

Mixing and Applying



Important precautions:

- Remove toys and pet dishes before spraying.
- Don't smoke, drink, or eat while applying pesticides.
- Use poison baits cautiously (they may attract children, pets, wildlife).
- Avoid environmental harm (water resources, bees/beneficials, wildlife).

Pesticide Poisoning



- Pesticide label provides treatment info.
- Take label with you to the medical facility.

Symptoms

- Blurred vision
- Diarrhea
- Dizziness
- Excessive sweating
- Fatigue
- Headache
- Vomiting
- Stomach cramps

FL Poison Info Center Network

1-800-222-1222



- Provides emergency poison information
- Three Poison Control Centers (Jacksonville, Miami, and Tampa)
- Toll-free hotline available 24/7
- Manned by specially-trained medical staff

Pesticide Labels



Pesticide Storage

- Store in a cool, dry, ventilated location.
- Store out of the reach of children.
- ***Never*** store in food or drink containers.



Pesticide Labels



Disposal of Unused Product



- Spray out excess on an appropriate area.
- Do not put in the trash.
- Never pour on the ground or down drains, toilets, or sewer.
- Give to a friend/neighbor.
- Take to a household hazardous waste facility or event: <http://earth911.com/>.

Disposal of Empty Containers



- Liquid formulations – triple rinse; spray out rinsate.
- Dry formulations – shake out excess onto treated site.
- Burning may be prohibited by local ordinance.
- Never use them as storage containers for other substances.

Spills

- Wear PPE during clean-up.
- Don't hose down (just spreads it) .
- Absorb liquid spills.
- Consult the label.



Why Pesticides Fail

Failure is usually due to incorrect:

- Pest ID
- Pesticide
- Dosage
- Timing
- Application
- Environmental conditions
- Equipment

...OR pest may be resistant to the product



REVIEW...

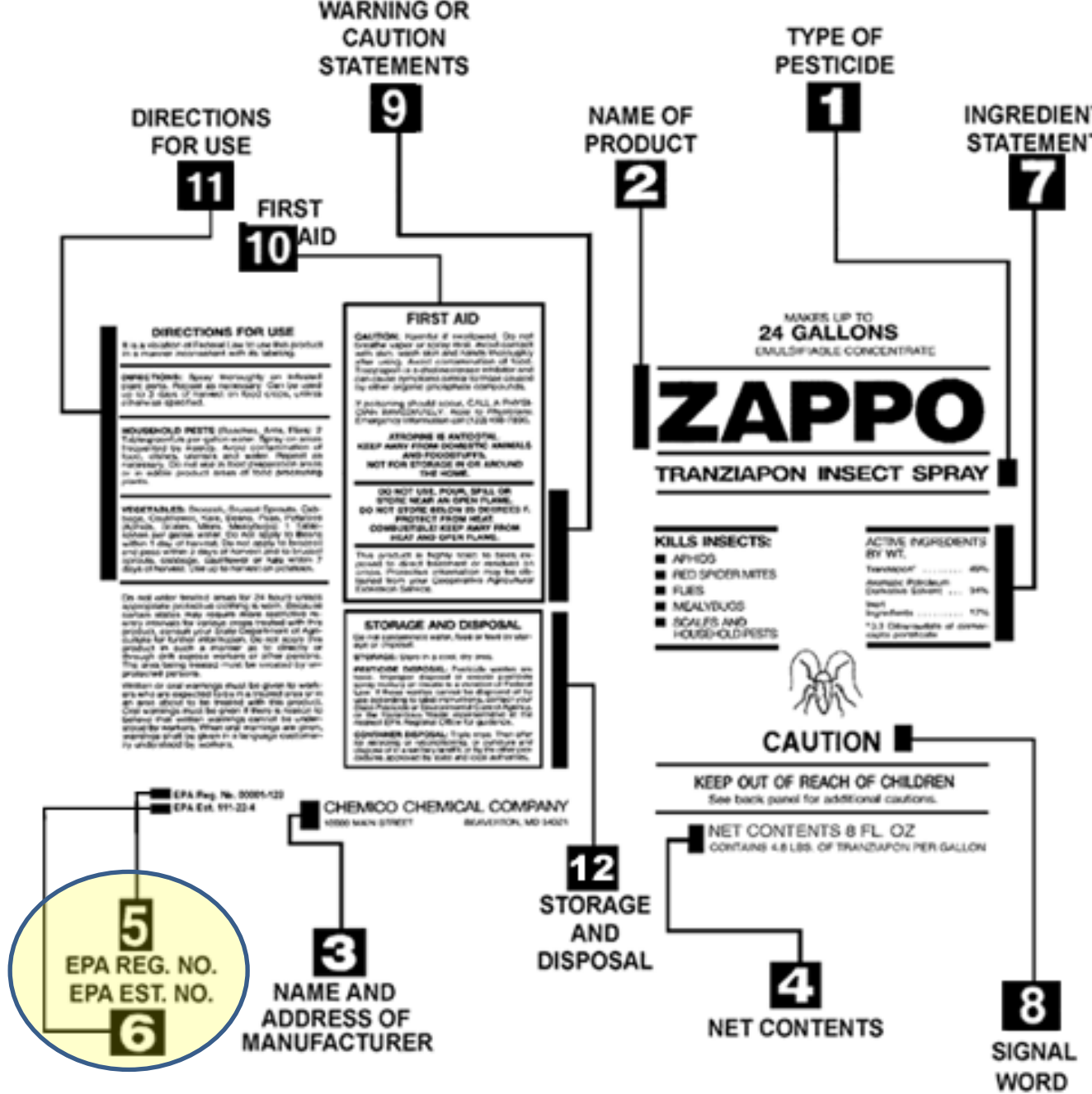
ALWAYS READ THE LABEL!



The label is the law – It provides:

- Where and on what it can be used
- The general toxicity of the product
- Hazards to humans, pets, environment
- PPE – Personal Protective Equipment to wear
- Mixing and application directions
- First Aid Info - How to treat exposure
- Days to harvest (if plant is an edible)
- Storage & disposal instructions

Label Info



Activity 1: Label Quiz

- Individually, complete the Label Quiz included in your Student Manual.



Acknowledgements



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