# Introduction to Pesticide Safety

Texas School IPM Program


# What is a pesticide

- Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest.
- Any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant.
- Any nitrogen stabilizer.
- A product is likely to be a pesticide if the labeling or advertising:
  - Makes a claim to prevent, kill, destroy, mitigate, remove, repel or any other similar action against any pest.
  - Indirectly states or implies an action against a pest.
  - Draws a comparison to a pesticide.
  - Pictures a pest on the label.

# Not considered pesticides

- **Drugs** used to control the diseases of humans or animals, which are regulated by the FDA
- **Fertilizers** and soil nutrients
- **Certain low-risk substances** such as cedar chips, garlic and mint oil are exempted from regulation by EPA *(requires license)*
    - 25b classification requires no signal word (mostly food-safe compounds)
- Pest control **devices** (i.e., mousetraps) are not pesticides, but subject to labeling requirements

# There are many kinds of pesticides

# …and many pesticide “modes of action” (how a pesticide works on an organism)

- Nervous system poisons
  - Acts on the nerve
- Metabolic inhibitors
  - Affect ability of target to process food
- Hormone mimics
  - Disrupt normal growth & reproduction
- Physical poisons
  - Physically damage insect
- Repellents & attractants

# First rule of toxicology: The dose makes the poison

- Paracelsus: a 16th Century Swiss alchemist.
- His most famous toxicology quote:
- *All things are poisons, there is nothing which is not a poison; the right dose differentiates a poison and a remedy.*

# Not all pesticides are equally toxic!

First rule of toxicology: The dose makes the poison

All things are poison, and nothing is without poison; only the dose permits something not to be poisonous.

So how do we measure this?

# $LD_{50}$

A measurement of relative toxicity used by toxicologists today

Lethal Dose 50 - The amount of material needed to kill half of a test population.  A statistically valuable estimate of average toxicity.

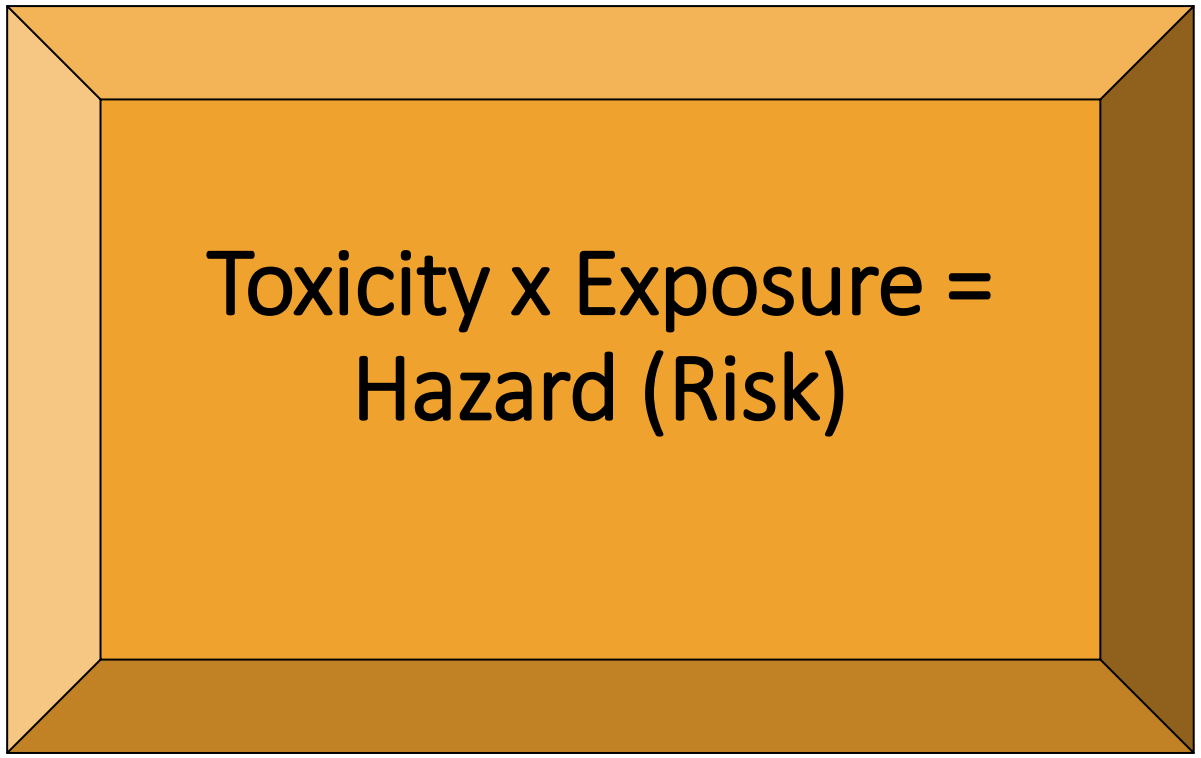
# Mg/Kg

Most common unit used in LD50s.

Amount of toxin (in milligrams) per Kilogram of body weight of the test subject (same as parts per million)

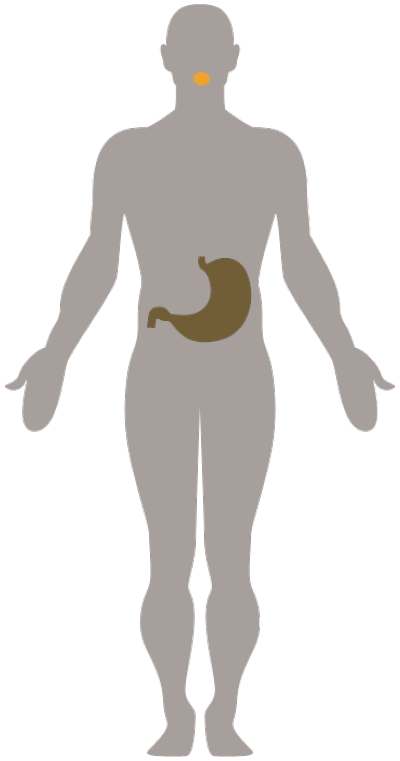
| Hazard Indicators | Highly Toxic 1 | Moderately Toxic 2 | Slightly Toxic 3 | Practically Nontoxic 4 |
|---|---|---|---|---|
| **Signal Word** | DANGER (Poison Skull & Crossbones) | WARNING | CAUTION | CAUTION or no signal word |
| **Acute Oral $LD_{50}$** | 0 - 50 mg/kg | > 50 - 500 mg/kg | > 500 -5000 mg/kg | > 5000 mg/kg |
| **Acute Dermal $LD_{50}$** | 0- 200 mg/kg | > 200 - 2000 mg/kg | > 2000 - 5000 mg/kg | > 5000 mg/kg |
| **Acute Inhalation $LC_{50}$** | 0- 0.05 mg/liter | > 0.05 - 0.5 mg/liter | > 0.5 - 2 mg/liter | > 2 mg/liter |
| **Primary Eye Irritation** | Corrosive: corneal opacity or irritation persisting for more than 21 days | Corneal involvement or other eye irritation clearing in 8-21 days | Corneal involvement or other eye irritation clearing in 7 days or less | Minimal effects clearing in less than 24 hours |
| **Primary Skin Irritation** | Corrosive (tissue destruction into the dermis and/or scarring) | Severe irritation at 72 hours (severe erythema or edema) | Moderate irritation at 72 hours (moderate erythema) | Mild or slight irritation at 72 hours (no irritation or slight erythema) |
| **Approximate Oral Dose that can kill the average adult human** | A few drops to teaspoon full (even on skin contact) | More than 1 teaspoonful to 3 teaspoonfuls | More than 1 oz to 1 pint or 1 pound | More than a pint or pound |

Choosing a low-toxicity product is not the only way to reduce risk

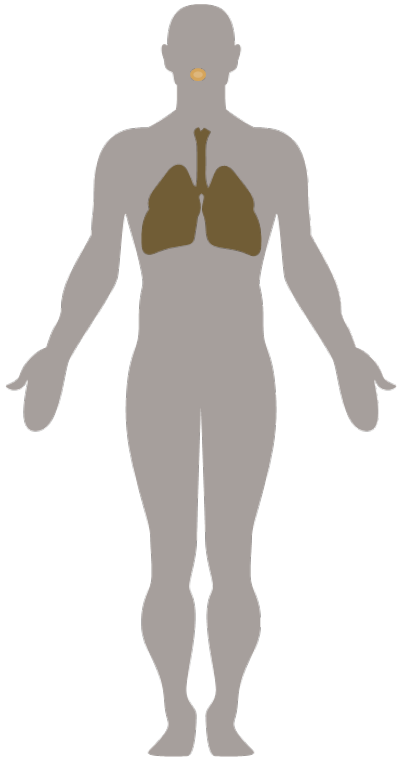



**Reduce risk by reducing your exposure…Read the label!**

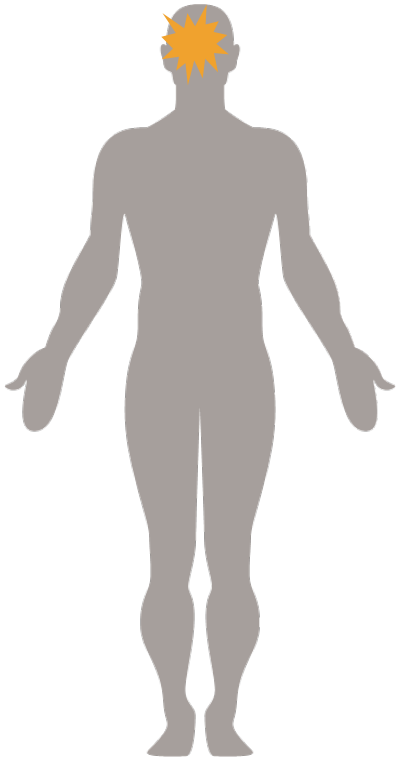
# Routes through which pesticides can enter the body



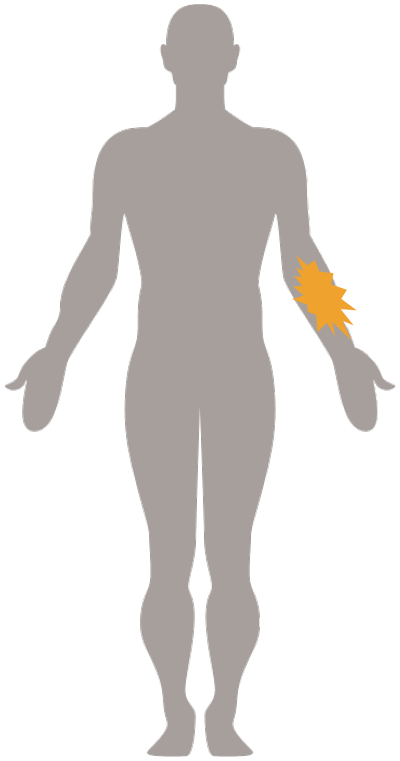
Oral



Inhalation



Ocular



Dermal

# Potential pesticide hazards

- Acute effects happen quickly during or after exposure
- Delayed effects may take time to develop after an exposure
- Chronic effects are the result of exposures over a long period of time
- Sensitization is the gradual development of an allergic reaction to pesticides

# Most common site of exposure

# PPE & Decontamination

- Make sure everyone has access to Personal Protective Equipment
- Make sure there is enough materials for spill clean up
- Decontamination Supplies
- Remember heat stress is a factor in Texas!

# Personal Protective Equipment

| | |
|---|---|
| **Appropriate clothing** | Long pants |
| | Chemical resistant shoes |
| | Long-sleeved shirt |
| **Protective gear** | Chemical resistant gloves |
| | Goggles |
| | Pesticide-rated respirator |

**Table 1. Minimum personal protective equipment (PPE) and work clothing for handling activities.**

| Route of exposure | Toxicity category of end- use product | | | |
|---|---|---|---|---|
| | I | II | III | IV |
| Dermal toxicity or skin irritation potential | Coveralls worn over long-sleeved shirt and long pants | Coveralls worn over long-sleeved shirt and long pants | Long-sleeved shirt and long pants | Long-sleeved shirt and long pants |
| | Socks | Socks | Socks | Socks |
| | Chemical-resistant footwear | Chemical-resistant footwear | Shoes | Shoes |
| | Chemical-resistant gloves | Chemical-resistant gloves | Chemical-resistant gloves | No minimum |
| Inhalation toxicity | Respiratory protec-tion device | Respiratory protec-tion device | No minimum | No minimum |
| Eye irritation potential | Protective eyewear | Protective eyewear | No minimum | No minimum |


# Gloves should be

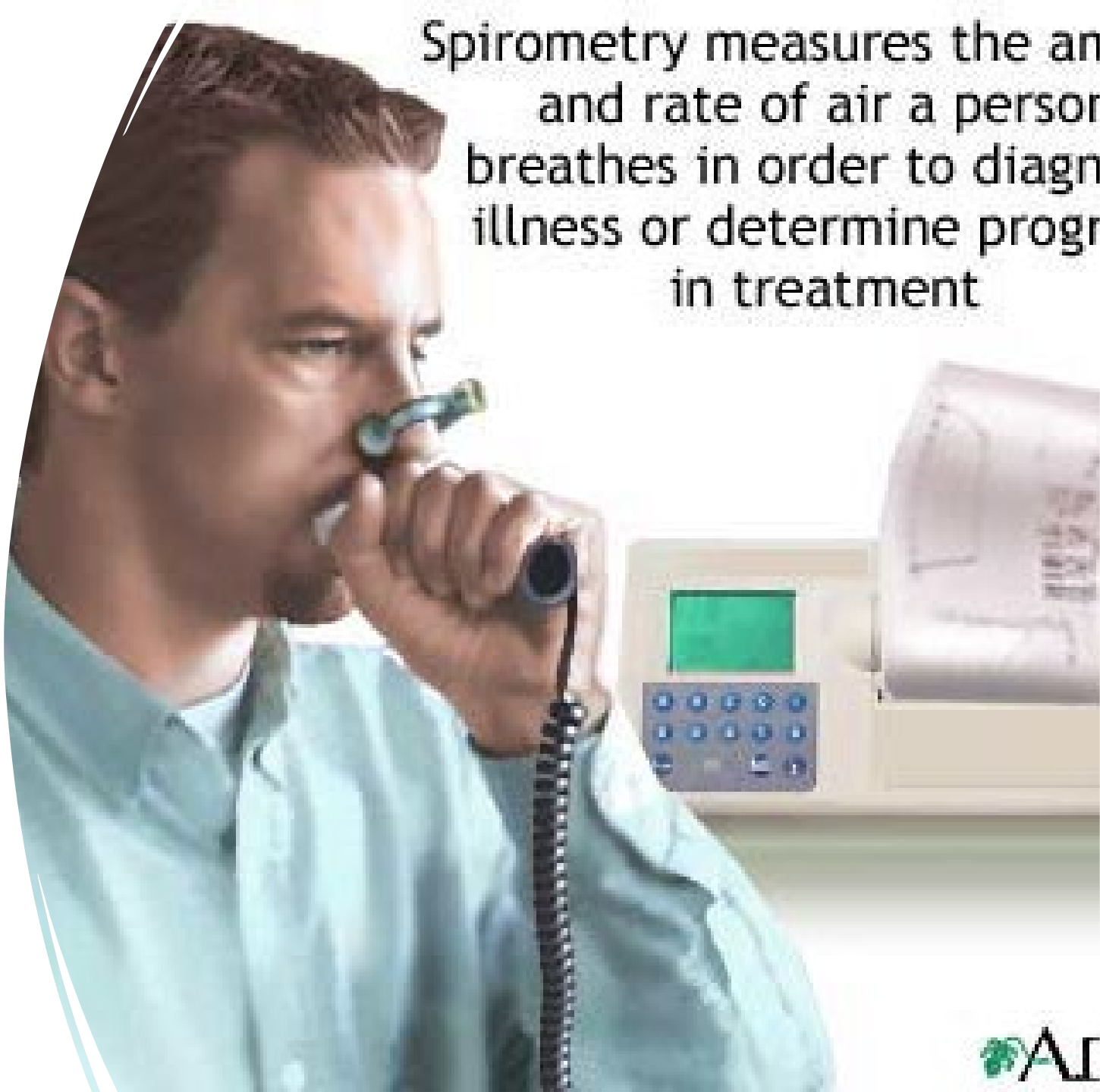
- Resistant to organic solvents
- Unlined
- Long enough to protect wrists, arms
- Best:
  - Natural rubber
  - Butyl
  - Nitrile

# Respirators


- For toxic dusts, sprays
- NIOSH approval number
- Rated for pesticides
- Look for tight seal
- Must have pre-filter and organic vapor cartridge
- For TDA  or other health inspection purposes make sure respirator stored properly on truck.
- Must have a Fit Test medical evaluation

# Respirators and Physical Fitness

- Medical evaluations are required for anyone wearing.
- Breathing through a respirator is work for the body.
- Respirators can be hazardous to people with heart or lung problems.



# Goggles

- Not the same as safety glasses
- Use when directed by label
- Often used with respirator

# Coveralls

- Recommended for most applications
- Remove and wash after use
- Tyvek© lightweight, relatively inexpensive and washable
- Wash pesticide contaminated clothes separately
  - Hot water
  - Two cycles

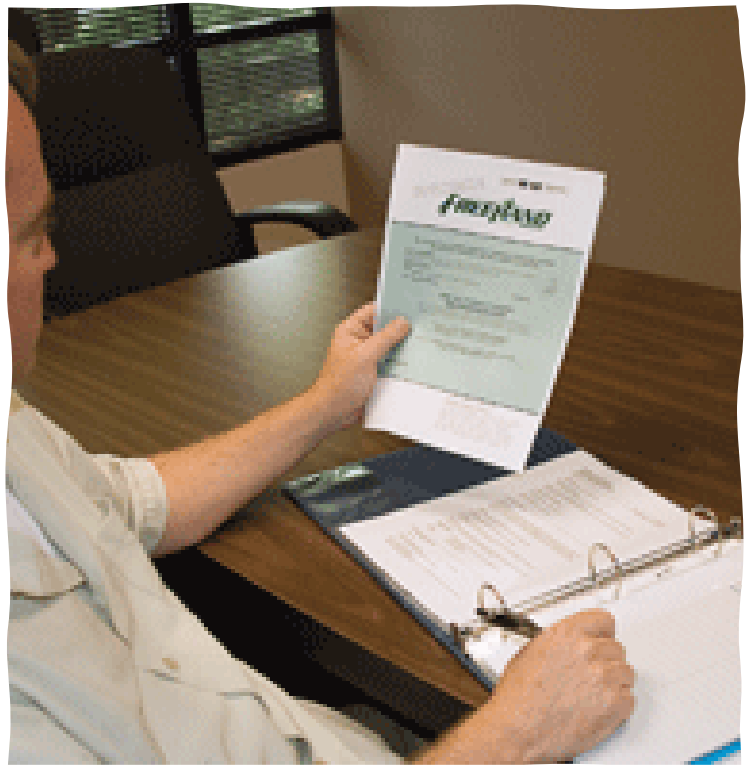
# Pesticide Storage Guidelines

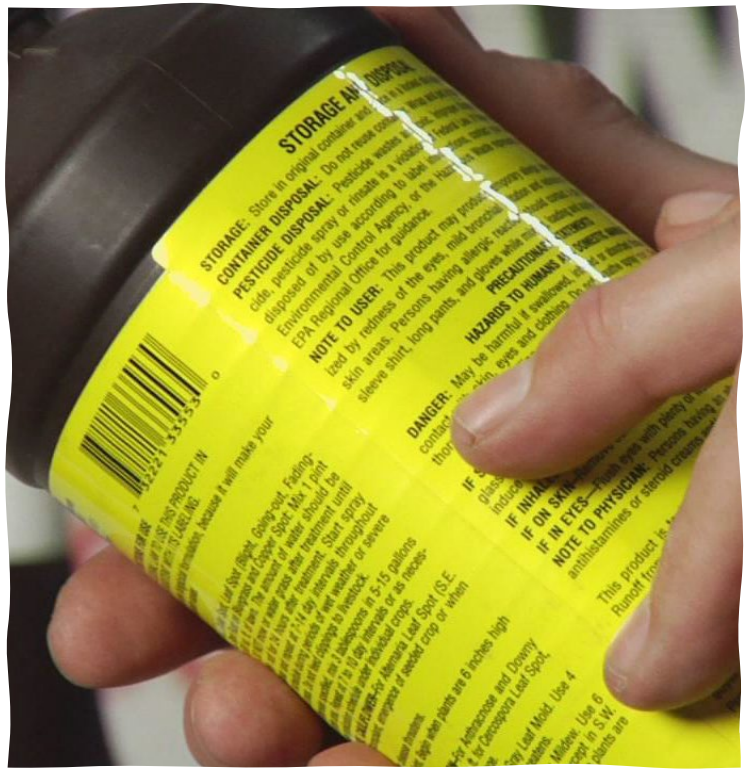
- Establish a suitable storage site
- Must be secure
- Temperature must be controlled
- Nonporous flooring
- Runoff protection
- Separate storage for pesticides, food, feed, seed, fertilizer and equipment


# Pesticide Storage Guidelines

- Use original containers only
- Labels must be kept on containers--intact and legible
- Watch for container damage
  - (tears, leaks, rust)
- Keep good inventory
- Consider pesticide shelf life

# Pesticide labeling






# Pesticide labeling

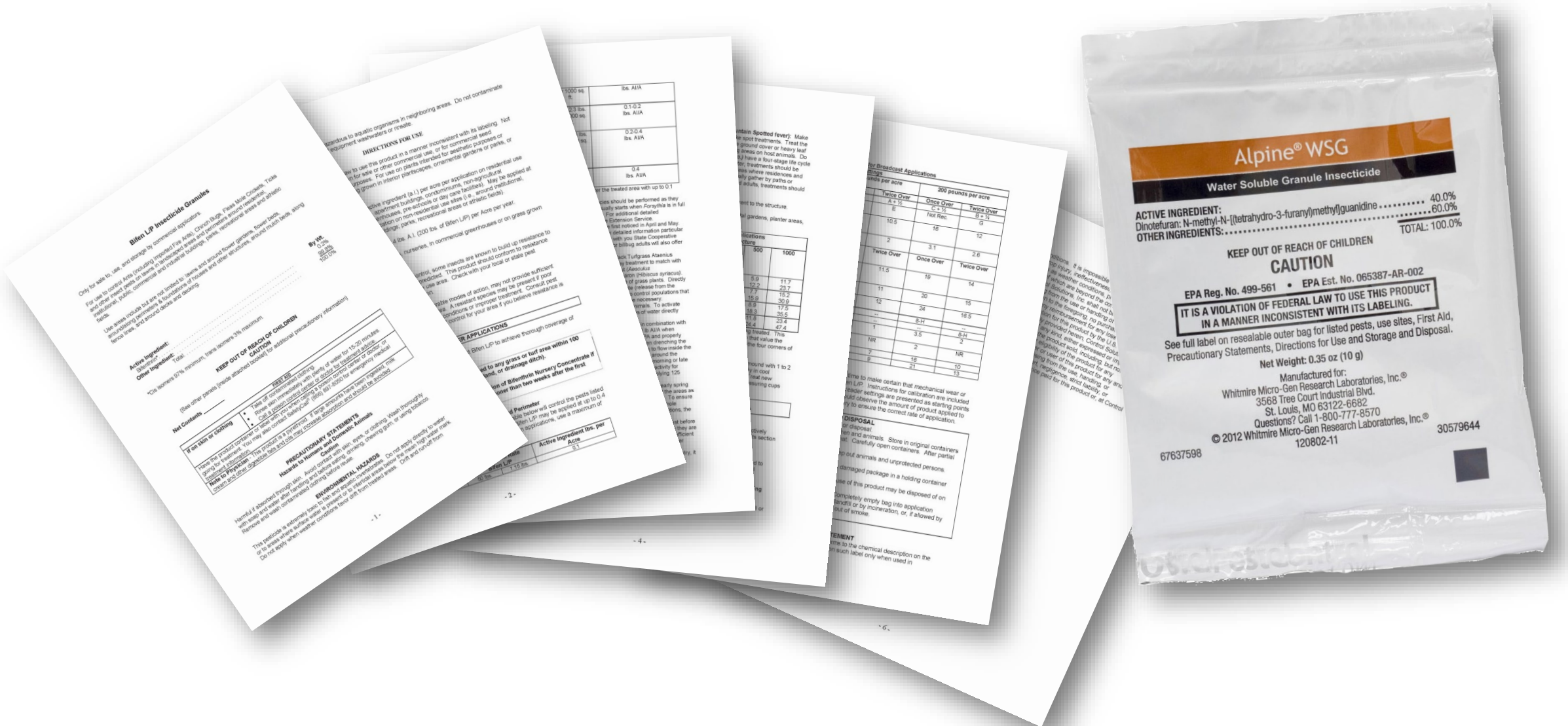
Most important source of information about a pesticide

The label is the law!

Read the label

| | | |
|---|---|---|
| before you buy/sell the product | before you use the product | before you dispose of the product |

# Pesticide Labels may be extensive documents or text printed directly on the pesticide container



# Legal considerations

- Use of any pesticide inconsistent with its label  is prohibited by federal and state law
- Deliberate violations of the label can result in heavy fines, imprisonment, or both

# Stop here for label review

- Trade name
- Ingredients
- Manufacturer name and address
- EPA Establishment No
- EPA Registration No.
- Special consideration
- Directions for use
- Child Warning Statement
- Front panel precautionary statements
- Statement of Practical Treatment

# Safety Data Sheets (HCS 2012/GHS Format)

On March 26, 2012, OSHA published the final rule of its revised Hazard Communication Standard (HCS) 29 CFR §1910.1200 to align with the Globally Harmonized System for the Classification and Labeling of Chemicals (GHS).

One of many changes to the HCS is the move from a performance-oriented to a uniformity-oriented approach or standardized format for Safety Data Sheets (SDS), previously called Material Safety Data Sheets (MSDS). The goal is to enhance hazard communication and workplace safety through consistency.

### Retained Requirements

- Employers must have an SDS in the workplace for each hazardous chemical used.
- SDS must be readily available to employees in their work areas and during their shifts.
- SDS must be in English.

### New Provisions

- SDS must be in a uniform format that includes at least the required section numbers, headings and associated information.*

### Compliance Dates

- By December 1, 2013, employers must train employees on new Safety Data Sheets.
- By June 1, 2015, all SDSs must be in the uniform format as prescribed in HCS 2012.

* This poster describes the minimum information that an SDS must include to comply with the

## 1 Identification

(a) Product identifier used on the label;
(b) Other means of identification;
(c) Recommended use of the chemical and restrictions on use;
(d) Name, address, and telephone number of the manufacturer, importer, or other responsible party;
(e) Emergency phone number.

## 2 Hazard(s) Identification

(a) Classification of the chemical;
(b) Signal word, hazard statement(s), symbol(s) and precautionary statement(s);
(c) Unclassified hazards.

## 3 Composition/Information on Ingredients

**For Substances**
(a) Chemical name;
(b) Common name and synonyms;
(c) CAS number and other unique identifiers;
(d) Impurities and stabilizing additives which are classified.
**For Mixtures** *(In addition to required substance information)*
The chemical name and concentration or concentration ranges of all ingredients which are classified as health hazards.
***Note on Trade Secret Claims:*** *Statement must be provided if chemical identity and composition have been withheld.*

## 4 First Aid Measures

(a) Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion;
(b) Most important symptoms/effects, acute and delayed;
(c) Indication of immediate medical attention and special treatment needed, if necessary.

## 5 Fire Fighting Measures

(a) Suitable (and unsuitable) extinguishing media;
(b) Specific hazard arising from the chemical (e.g., nature of any hazardous combustion products);
(c) Special protective equipment and precautions for fire-fighters.

## 7 Handling and Storage

(a) Precautions for safe handling;
(b) Conditions for safe storage, including any incompatibilities.

## 8 Exposure Controls/Personal Protection

(a) OSHA permissible exposure limit (PEL) and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet;
(b) Appropriate engineering controls;
(c) Individual protection measures, such as personal protective equipment.

## 9 Physical and Chemical Properties

(a) Appearance (physical state, color, etc.);
(b) Odor;
(c) Odor threshold;
(d) pH;
(e) Melting point/freezing point;
(f) Initial boiling point and boiling range;
(g) Flash point;
(h) Evaporation rate;
(i) Flammability (solid, gas);
(j) Upper/lower flammability or explosive limits;
(k) Vapor pressure;
(l) Vapor density;
(m) Relative density;
(n) Solubility(ies);
(o) Partition coefficient: n-octanol/water;
(p) Auto-ignition temperature;
(q) Decomposition temperature;
(r) Viscosity.

## 10 Stability and Reactivity

(a) Reactivity;
(b) Chemical stability;
(c) Possibility of hazardous reactions;
(d) Conditions to avoid (e.g., static discharge, shock, or vibration);
(e) Incompatible materials;
(f) Hazardous decomposition products.

## 11 Toxicological Information

Description of various toxicological (health) effects and available data;

## 12 Ecological Information (Non-Mandatory)

(a) Ecotoxicity (aquatic and terrestrial, where available);
(b) Persistence and degradability;
(c) Bioaccumulative potential;
(d) Mobility in soil;
(e) Other adverse effects (such as hazardous to the ozone layer).

## 13 Disposal Considerations (Non-Mandatory)

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.

## 14 Transport Information (Non-Mandatory)

(a) UN number;
(b) UN proper shipping name;
(c) Transport hazard class(es);
(d) Packing group, if applicable;
(e) Environmental hazards (e.g., Marine pollutant (Yes/No));
(f) Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code);
(g) Special precautions.

## 15 Regulatory Information (Non-Mandatory)

Safety, health and environmental regulations specific for the product in question.

## 16 Other Information

The date of preparation of the SDS or the last change to it.

# Hazard Communication Safety Data Sheets

- **Section 1, Identification** includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.
- **Section 2, Hazard(s) identification** includes all hazards regarding the chemical; required label elements.
- **Section 3, Composition/information on ingredients** includes information on chemical ingredients; trade secret claims.
- **Section 4, First-aid measures** includes important symptoms/effects, acute, delayed; required treatment.
- **Section 5, Fire-fighting measures** lists suitable extinguishing techniques, equipment; chemical hazards from fire.
- **Section 6, Accidental release measures** lists emergency procedures; protective equipment; proper methods of containment and cleanup.

# Hazard Communication Safety Data Sheets

- **Section 7, Handling and storage** lists precautions for safe handling and storage, including incompatibilities.
- **Section 8, Exposure controls/personal protection** lists OSHA's Permissible Exposure Limits (PELs); ACGIH Threshold Limit Values (TLVs); and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the SDS where available as well as appropriate engineering controls; personal protective equipment (PPE).
- **Section 9, Physical and chemical properties** lists the chemical's characteristics.
- **Section 10, Stability and reactivity** lists chemical stability and possibility of hazardous reactions.
- **Section 11, Toxicological information** includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity

# Other Info

- Section 12, Ecological information*
  Section 13, Disposal considerations*
  Section 14, Transport information*
  Section 15, Regulatory information*
- **Section 16, Other information,** includes the date of preparation or last revision.
- Employers must ensure that SDSs are readily accessible to employees**.**


English version shown here

# Thank you let’s take a break