Pesticide Safety
& Pesticide Categories

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What are pesticides?

• Any substance or mixture of substances used for controlling, preventing, destroying, repelling, or mitigating pests.
  • insecticides, herbicides, fungicides
  • bactericides
  • repellents, attractants
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

Not considered pesticides
There are many kinds of pesticides
Modes of Action

- 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

How a pesticide works on an organism
Common Signs and Symptoms of Pesticide Poisoning

- Eye irritation
- Nose and throat pain
- Skin rash
- Dizziness
- Headache
- Muscle aches or cramps
- Exhaustion
- Nausea
- Diarrhea
- Chest pain
- Breathing difficulties
- Blurred vision
- Excessive salivation or drooling
- Very small, pinpoint pupils
- Lack of muscle control
- Convulsions or seizures
- Unconsciousness
Pesticide Poisoning Symptoms Can be Confused with Other Illnesses

- Cold
- Flu
- Heat illness
- Food poisoning
- Hangover
The Type and Severity of Symptoms Depend on:

- The Pesticide
- The Route of Exposure
- The Length of Exposure
- How Often you are Exposed
- Age of the Person
- Health of the Person
Not all pesticides are equally toxic!
First rule of toxicology: The dose makes the poison.

So how do we measure toxicity?
LD50

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.
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)

Mg/Kg
# EPA Pesticide Toxicity Classes

<table>
<thead>
<tr>
<th>Toxicity Category</th>
<th>Extremely Toxic</th>
<th>Very Toxic</th>
<th>Moderately Toxic</th>
<th>Slightly Toxic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal Word</td>
<td>Danger</td>
<td>Warning</td>
<td>Caution</td>
<td>Caution Or no signal word</td>
</tr>
<tr>
<td>Oral LD 50 (mg/Kg)</td>
<td>0-50</td>
<td>50-500</td>
<td>500-5,000</td>
<td>&gt;5,000</td>
</tr>
<tr>
<td>Equivalent Lethal Dose for 154 lb male or 136 lb female</td>
<td>Less than teaspoon</td>
<td>Teaspoon to ounce</td>
<td>Ounce to a pint</td>
<td>Pint to a quart or more</td>
</tr>
</tbody>
</table>
Choosing a low-toxicity product is not the only way to reduce risk

Toxicity $\times$ Exposure = Hazard

Reduce risk by reducing your exposure... Read the label!
Routes through which pesticides can enter the body

- Oral
- Inhalation
- Ocular
- Dermal
Skin exposure

- Skin comes in direct contact with pesticides or pesticide residues
- Rash, blisters, skin irritations
Eye exposure

- Pesticide drift
- Rubbing eyes with unwashed hands
Respiratory exposure

• Vapor or dust from pesticide drift
• Entering treated areas
Oral exposure

• Drink, smoke, eat, or chew gum with unwashed hands
• Unwashed produce
• Drinking from pesticide containers
• Drinking irrigation water
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
Acute pesticide injury

Headaches

Loss of consciousness

Eye irritation

Nose pain

Throat pain

Chest pain

Difficulty breathing

Skin irritation

Skin rashes

Nausea
Severe acute poisoning

Unconsciousness

Chest pain
Breathing difficulty

Lack of muscle control

Severe constriction of pupils

Salivation Drooling
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
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.
- Medical Fit Test (next slide Don)
Rules Meant to Protect Respiratory Protection

- Be medically cleared
- Fit tested
- Instructed on use and maintenance
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\textsuperscript{©} 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

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

1. Trade name
2. Ingredients
3. Manufacturer name and address
4. EPA Establishment No
5. EPA Registration No.
6. Special consideration
7. Directions for use
8. Child Warning Statement
9. Front panel precautionary statements
10. Statement of Practical Treatment
Pesticide Selection*

• All pesticides classified as Red, Yellow or Green Category
• Sometimes confusing aspect of school IPM requirements
• Coordinator must have expertise in classifying pesticide products

*Texas (not national) regulations and definitions
A quick list of Green Category Pesticides

- Certain inorganic compounds
- Insect growth regulators
- Inaccessible baits
- Microbe-based insecticides
- Botanical insecticides
  - With no more than 5% synergist
- Biological (living) control agents
- Pesticidal soaps and horticultural oils
Certain inorganic pesticides

- Boric acid
- Borax
- Disodium octoborate tetrahydrate
- Silica aerogel
- Diatomaceous earth
Low-toxicity Inorganics
Insect Growth Regulators (IGRs)

- Halofenozide (turfgrass)
- Hydroprene (cockroach control)
- Methoprene (fire ant, mosquito, flea control)
- Pyriproxifen (fire ant, flea, cockroach control)
- Tebufenozide (caterpillar control)
Insect growth regulators
Inaccessible baits

- fire ant baits
- containerized cockroach baits
- granular ant, cockroach and cricket baits
- Rodent baits
Baits
Microbe-based pesticides

- Active or killed microbes
  - *Bacillus thuringiensis*, *Beauveria bassiana*, etc.
- Microbial byproducts
  - Spinosad, avermectin
Microbe-based insecticides
Botanicals
pesticides derived from plants
(with no more than 5%
synergist)

- Pesticides derived from plants
  - pyrethrins
  - neem extracts & oils
  - rotenone
  - Mint oils
  - citrus oils
  - clove oil
  - 2-phenethyl propionate
  - other essential oils
Pyrethrins

- From ground-up flowerheads of pyrethrum daisies
- A natural combination of six compounds: pyrethrins I and II, jasmolin I and II, and cinerin I and II
- More uses approved than any other insecticide
- Usually includes a “synergist” to keep insects from detoxifying it

*Chrysanthemum cinerariifolium*
To qualify as Green

- Botanicals may not contain more than 5% synergist
- A synergist is anything added to a substance for increasing the effectiveness of one or more of its properties. Most insecticide synergists block insect enzymes that detoxify some active ingredients.
- Examples of pesticide synergists
  - Piperonyl butoxide (PBO)
  - Sesamex
  - MGK-264, N-Octyl bicycloheptene dicarboximide
Biological control agents

Living organisms used to control pests
Low-toxicity contact insecticides
Insecticidal soaps & oils

- Kill small and soft-bodied insects and mites. Must come in direct contact with pest to kill. Short residue.
- Safer’s soap,
- Sunspray Ultrafine Spray Oil
- Various plant oils
Low-toxicity contact insecticides
Insecticidal soaps & oils
Yellow Category Pesticides

- Definition: A pesticide will be designated as a Yellow Category pesticide if:
  - it does not meet the criteria to be designated as a Green Category and...
  - It belongs to EPA toxicity categories III or IV and
  - Carries a CAUTION signal word on the label, unless no signal word is required to appear on the product label as determined by EPA
  - MUST have a Justification Form
Pyrethroids
Most will be Yellow Category

- Usually identified by –thrin suffix
  - permethrin
  - cyfluthrin
  - bifenthrin
  - allethrin
  - sumithrin
  - tetramethrin
  - *Esfenvalerate*
  - *Fluvalinate*
  - *Etofenprox*
Yellow Products Examples
Example 1  Yellow Category

There are multiple fire ant mounds that appeared after a spring or fall rain on an athletic field or playground. The IPM coordinator contacts the pesticide applicator and requests a treatment ASAP. The applicator responds that the product they can use is Advion and they can be out tomorrow to make the treatment, but the fire ants won’t be eliminated for another 2 days. The coordinator agrees, then the applicator needs to complete the form. They will also need to post the outdoor area at the time of application with a sign, or secured using a locking device, a fence or other practical barrier such as commercially available barrier caution tape, or periodically monitored to keep students out of the treated area until the allowed reentry time of 4 hours after application is completed. Remember the time for reentry starts once the application is completed.

- Description of pest problem: Heavy rains and varying temperatures have caused fire ant mounds to appear on elementary playground. Fire ants can still children which can cause an adverse reaction.

- Justification for use: Advion is a fast-acting fire ant bait that can help reduce and control fire ants.
Red Category Pesticides

• Definition: A pesticide will be designated as a Red Category Pesticide if:
  
  • all active ingredients belong to EPA toxicity category I or II;
  
  • it contains a WARNING or DANGER signal word on the product label; AND
  
  • it has been designated as a restricted use pesticide, a state-limited-use pesticide or a regulated herbicide…

• A conversation between applicator and coordinator with a completed justification form
• Your school district has built or renovated a school campus and during construction the turf area was not maintained. It’s early March and the area is covered in henbit, chickweed, and dandelions. Your grounds manager comes to you and requests to use Trimec Classic Broadleaf Herbicide so that he can “kill” everything so we can sod for turf this spring. This product has a Danger Signal word making it Red Category.

• Description of pest problem: Broadleaf weeds are covering a large turf area that needs to be eliminated prior to installing replacement turf.

• Justification for use: Trimec Classic is a fast-acting herbicide that control a variety of broadleaf weeds. This product will also allow us to re-establish a turf area within three weeks.

• Things to remember:
  • Post a sign or restrict entry to students for 8 hours after the application
  • Contact campus to remind staff to remain off the area
Hands On Exercise

• Tell US
  • Trade Name
  • Active Ingredient
  • Signal Word
  • Is it Green, Yellow or Red?