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Today's topics


- Pesticide storage
- Pesticides in the Environment
- Pesticide hazards and first aid
- Personal protective equipment

- But first a POP QUIZ!!.



Clickers

- Responses are **anonymous**
- Will not change the station on your T.V.
- Details
 - Clickers are set on channel 41
 - If asked, set your clicker for channel 41. Press center button to enter.



Work clothes worn to apply pesticides should be laundered with a suitable detergent:

- After each day's use.
- After they get wet with spray.
- When they have a strong odor like the pesticide.

Under which conditions are pesticides more likely to leach through soil?

- Heavy clay soil, high in organic matter
- Sandy soil, high in organic matter
- Sandy soil, low in organic matter

Which of the following is not part of a Spill Clean Up Kit?

- Shovel
- Heavy paper bags
- Broom
- Absorbent material

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

- A. True
- B. False

Which property of a pesticide would make it more likely to move in surface water runoff?

- A. High solubility
- B. High adsorption
- C. High volatility
- D. High degradation

Which two factors are most important in avoiding vapor drift?

- A. Droplet size and wind speed
- B. Air stability and temperature
- C. Temperature and pesticide volatility

Which best management practice will help prevent contamination of surface water and groundwater by pesticides?

- A. Using pesticides that are highly water soluble
- B. Following IPM principles
- C. Selecting persistent pesticides

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

Where does most pesticide exposure occur for pesticide handlers?

- A. Eyes
- B. Hands
- C. Forearms
- D. Feet
- E. Forehead
- F. Groin

Which of these is not minimum PPE?

- A. Short-sleeved shirt
- B. Long-pants
- C. Gloves
- D. Shoes plus socks
- E. Hat

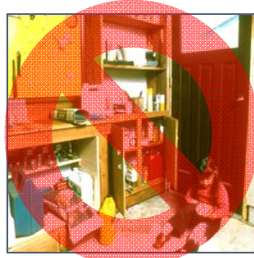
Storage, and Security

Chapter 8

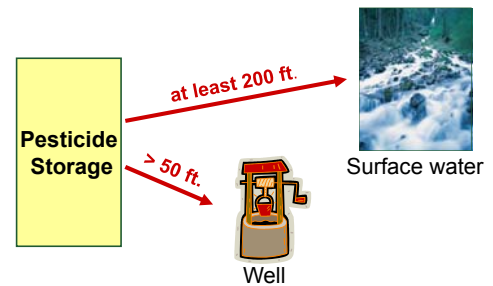
National Pesticide Applicator Certification
Core Manual

An Ideal Pesticide Storage Site Protects
Against:

- Exposure to people and animals
- Environmental contamination
 - Temperature extremes and excess moisture
 - Ventilation fan
- Theft, vandalism, and carelessness
- Liability

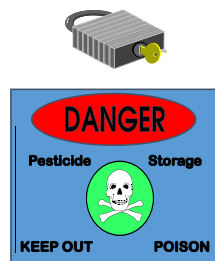


Pesticide Storage



Secure the Site!

- Use a dependable lock
- Post highly-visible warning signs on doors, windows
- Post "No Smoking" warnings, since many pesticides are highly flammable!



Control the Conditions

- ❖ Keep storage area cool, well-ventilated, and dry
- ❖ Excessive freezing or heat may cause containers to break, melt, explode, and some pesticides to volatilize, drift, degrade
- ❖ Use exhaust fans to reduce temperature, remove dust and vapor to the outside



Provide Adequate Lighting

- ❖ For reading labels, spotting leaks, and cleaning up spills
- ❖ Use **spark-proof** fixtures and switches!
 - ❖ Because some pesticides can volatilize



Keep Labels Legible

- ❖ If a product **label** is destroyed or damaged, immediately mark the container with:
 - ❖ Trade name and common name
 - ❖ EPA registration number
 - ❖ % of each active ingredient
 - ❖ Signal word
 - ❖ Use classification
- ❖ Request a replacement **label** from the dealer or distributor
- ❖ Always store in original container



Store Pesticides Safely!

- ❖ Store on sturdy metal shelving
- ❖ Place heaviest containers and liquids on low shelves
- ❖ Place large drums and bags on plastic pallets
- ❖ Seal dry materials in plastic bags



Safety Tips

- ❖ Have a plan
- ❖ Have absorbent materials ready for spills and leaks
 - ❖ Clay, pet litter, vermiculite
- ❖ Have a shovel, broom, heavy-duty plastic bags available

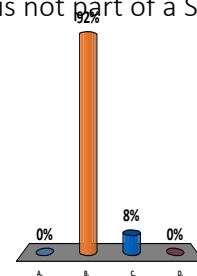


Emergency Equipment



Which of the following is not part of a Spill Clean Up Kit?

- A. Shovel
- ✓ B. Heavy paper bags
- C. Broom
- D. Absorbent material



Pesticides in the Environment

Chapter 7

National Pesticide Applicator Certification
Core Manual

Pesticides in the Environment

- ❖ EPA requires pesticides be tested to assess their potential for harming the environment
- ❖ EPA classifies some products as **restricted use** due to environmental concerns

Environmental Hazards sections of pesticide labels contain warnings about environmental harm that may be caused by pesticide products.

Understanding Pesticide Behavior in the Environment

- ❖ **Chemical characteristics** of pesticides
- ❖ **Pesticide movements** during and after application
- ❖ **special environmental issues**

ENVIRONMENT – all biotic & abiotic factors that act on organisms or biological communities

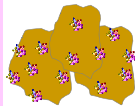
Pesticide Characteristics: Solubility

- ❖ The ability of a substance to dissolve in a solvent, usually water
- ❖ Soluble pesticides can (1) move in surface water runoff or (2) soak through soil into groundwater or (3) drift in the air as tiny water droplets.



Pesticide Characteristics: Adsorption (binding of chemicals to soil particles)

- ❖ **More adsorption** with oil-soluble pesticides
- ❖ **Clay and organic matter** increase binding capacity
- ❖ **Reduces the potential** for a pesticide to move laterally or vertically through soil



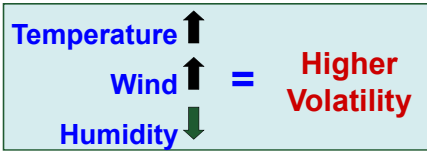
Pesticide Characteristics: Persistence

- ❖ Ability of a pesticide to remain present and active for a long time
- ❖ Provides for long-term pest control, but may harm sensitive plants and animals
- ❖ May lead to illegal residues on rotational crops



Pesticide Characteristic: Volatility

the tendency of a pesticide to change from liquid to a gas or vapor (fumigants)



LABELS may specify maximum temperatures for spraying operations

Undesirable Pesticide Movement

In and By Air: **DRIFT**

- ❖ **Check product label** for drift abatement instructions
 - ❖ are no-spray buffers required??
 - ❖ spray droplet size requirements
 - ❖ wind speed restrictions
 - ❖ application volume requirements
 - ❖ aerial application restrictions
 - ❖ warnings for sensitive crop or sites

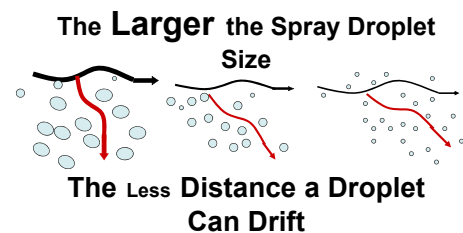
DRIFT – movement of airborne pesticide droplets from a treated area during spraying operations



Spray Drift Factors

1. Equipment management
2. Viscosity of a spray a solution (resistance to flow; water/molasses)
3. Weather conditions
4. **APPLICATOR PREPARATION**

Droplet Size During Spray Operations



Applicator Preparation

- ❖ The applicator's attitude is very important.
- ❖ The applicator assesses the site and concern level for drift.
- ❖ The applicator selects what application method and chemical formulation is most appropriate and sets up the equipment to either produce larger or smaller droplets.
- ❖ The applicator monitors the weather and makes the decision whether to spray or not.

Undesirable Pesticide Movement by and into Water Sources

Runoff -- pesticide movement by rain water over soil or urban surfaces into water sources

Streams, rivers, ponds, reservoirs, lakes and ground waters become pesticide contaminated

Surface and ground waters are our only water sources.



Pesticide Movement in & by Water

Leaching -- movement of pesticide by water through soil

- ❖ Horizontal or vertical movement
- ❖ Chemical characteristics that pose concern: high solubility, low adsorption, persistence



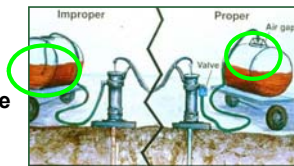
How To Keep Pesticides Out of Water Sources? I

- ❖ Use IPM
- ❖ Consider the geology
 - ❖ Where is the water table?
 - ❖ Are there sinkholes nearby?
- ❖ Consider soil characteristics
 - ❖ Is it susceptible to leaching?
- ❖ Select pesticides carefully
 - ❖ Is it susceptible to leaching?
- ❖ Follow **label** directions



Back-Siphon Prevention

- ❖ **Air gap:** keep the water supply above the level of the mixture
- ❖ Install a back-siphon valve (check valve)



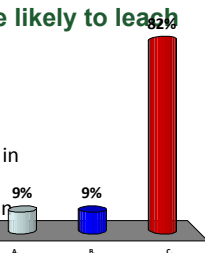
Preventing Injury to Organisms Near Pesticide Treated Areas

- ❖ Schools, playgrounds, parks
- ❖ Wildlife refuges, bee hives
- ❖ Yards, gardens, crops
- ❖ Buildings: homes, offices, stores, restaurants, factories
- ❖ Wilderness preserves
- ❖ Riparian areas, wetlands
- ❖ Endangered/threatened species and their habitats



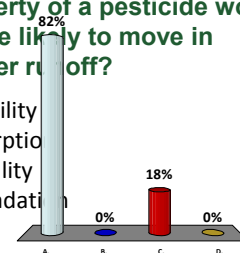
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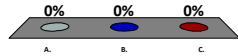
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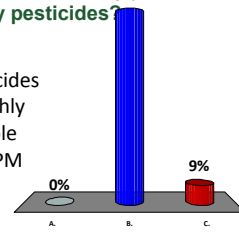
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- C. Selecting persistent pesticides



Pesticide Hazards and First Aid

Chapter 5

National Pesticide Applicator Certification Core Manual

Signal Words

Signal Word	Category	Toxicity	Oral LD ₅₀
Danger-Poison 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 or skin/eye
Caution	III	Slight	>500 mg/kg or skin/eye

Guthion® Solupak 50%
Wettable Powder Crop Insecticide
IN WATER SOLUBLE PACKETS

STOP - Read the label before use.
KEEP OUT OF REACH OF CHILDREN
ANGER POISON
PELIGRO

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
DANGER


AMINE 4
2,4-D WEED KILLER

KEEP OUT OF REACH OF CHILDREN
DANGER - PELIGRO

PRECAUTIONARY STATEMENTS
HAZARDS TO HUMANS AND DOMESTIC ANIMALS
DANGER - PELIGRO

Corrosive. Eye Damage

2115423-10G



Roundup ORIGINAL
AMMONIUM GLYPHOSATE

Complete Directions for Use
EPA Reg. No. 322-440
AVOID CONTACT WITH FOLIAGE, GREEN STEMS, EXPOSED NONWOODY ROOTS OR FRUIT OF GROUPS, DECIDUOUS PLANTS AND TREES, SINCE SEVERE INJURY OR DESTRUCTION MAY RESULT.
Roundup Original, Roundup and the four symbol are trademarks of Monsanto Company.
©2011
Read the entire label before using this product.
Use only according to label instructions.
Read "LIST OF WARRANTY AND LIABILITY" before buying or using. If terms are not acceptable, return all stock unopened.

STATEMENTS SHALL BE THE PURCHASE PRICE PAID BY THE USER OR BUYER FOR THE QUANTITY OF THIS PRODUCT INVOLVED, OR, AT THE DISCRETION OF THIS COMPANY OR ANY OTHER SELLER, THE RECEIPTMENT OF SUCH QUANTITY OR, IF NOT ACQUIRED BY PURCHASE, RECEIPTMENT OF SUCH QUANTITY BY ANY OTHER SELLER, THE COMPANY OR ANY OTHER SELLER BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL, OR SPECIAL DAMAGES.
Roundup and all parts are deemed to have accepted the terms of this LIST OF WARRANTY AND LIABILITY which may not be varied by any verbal or written agreement.

PRECAUTIONARY STATEMENTS
Harmful to Humans and Domestic Animals

Warnings: AVOID!
Do not use outdoors in alfalfa, because a allergic reaction or to replicate a allergic in alfalfa. Do you do not understand this term, but someone to explain it to you in detail!
CAUSES SUBSTANTIAL BUT TEMPORARY EYE IRRITATION.
IRRITANT IF SWALLOWED OR INHALED.
Do not get in eyes, on or in clothing.
Wash breathing system or spray mist.

PREVENTION: IF IN EYES, Immediately flush eyes with water and flush with plenty of water. Get medical attention.
IF SWALLOWED, remove individual to fresh air. If had breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.
IF INHALED, this product will cause gastrointestinal tract irritation. Immediately dilute by vomiting water or milk. Get medical attention. **NEVER USE ANYTHING BY ROUTE 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. Should clothing and other absorbent materials that have been drenched or heavily contaminated be removed and laundered or disposed of separately before being washed, and not laundered with other household laundry.

MICROFLO
The Microflo Company

KUMULUS® DF
fungistomycicide


ACTIVE INGREDIENT: 80%
Inert: 20%
NET WEIGHT: 100%

KEEP OUT OF REACH OF CHILDREN
CAUTION


FIRST AID
If swallowed: Call a Poison Control Center or doctor immediately for treatment advice. Drink person up a glass of water if able to swallow. Do not induce vomiting unless told to do so by the poison control center. 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
Harmful to Humans and Domestic Animals
Irritant if swallowed. Avoid breathing spray mist. Avoid contact with eyes, skin, and clothing.

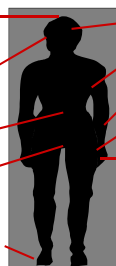
Routes of Entry: Skin (Dermal)



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%	Forehead 36%
Ear Canal 40%	Armpit 64%
Abdomen 18%	Forearm 9%
Genital Area 100%	Palm 12%
Ball of Foot 13%	Back of Hand 21%

Percent Dose Absorbed
Chemical -parathion
Malbach 1974

Greater dermal absorption

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

Least absorbed → Most absorbed

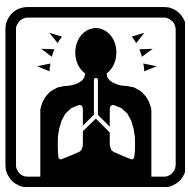


Granular (Least absorbed) | WP (Water Based) | EC (Emulsifiable Concentrate) (Most absorbed)

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!!



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

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 and administer activated charcoal in water **EXCEPT...**
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 and SDS) 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

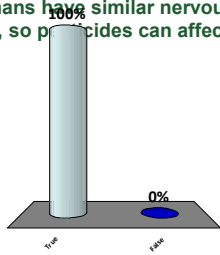
Know these key symptoms!

Heat Exhaustion Symptoms	OP Carbamate Poisoning Symptoms
Sweating	Sweating
Nausea	Nausea and diarrhea
Dry membranes dry mouth no tears no spit present	Moist membranes salivation tears spit present in mouth
Fast pulse	Slow pulse
Dilated pupils	Small or pinpoint pupils
CNS depression loss of coordination confusion flinching	CNS depression loss of coordination confusion coma

Pupil sizes is one of the best indicators.

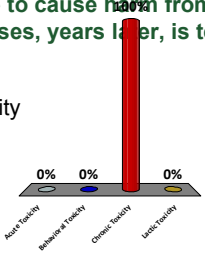
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✓ A. True
B. False



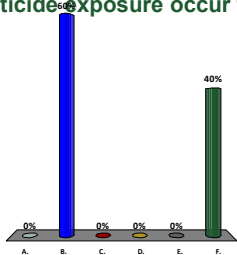
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✓ C. Chronic Toxicity
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Where does most pesticide exposure occur for pesticide handlers?

✓ B. Hands
A. Eyes
C. Forearms
D. Feet
E. Forehead
F. Groin



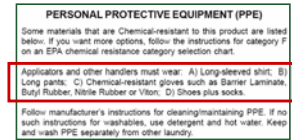
Personal Protective Equipment (PPE)

Chapter 6

National Pesticide Applicator Certification
Core Manual

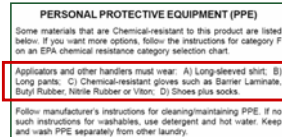
Read the label!!

- ❖ Follow directions for PPE
 - ❖ Handlers
 - ❖ Applicators
 - ❖ Early entry workers
- ❖ *Minimum* requirements are given – **can wear more**



Chemical-resistant Materials

- ❖ Read the **label**
 - ❖ What clothing is specifically required



Chemical-Resistant Clothing

- ❖ Prevents most chemicals from reaching the skin
- ❖ PVC plastic, rubber, non-woven coated fabrics



Rubber



Nitrile



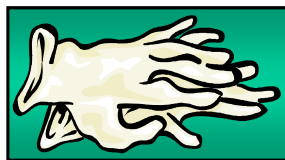
PVC



Barrier Laminate

Chemical-resistant Materials

- ❖ Watch for signs of wearing and degrading:
 - ❖ color change
 - ❖ spongy
 - ❖ swollen
 - ❖ jelly-like
 - ❖ cracked
 - ❖ brittle



Cotton, Denim, Leather:
Not recommended for most pesticide applications!



Personal Protective Equipment (PPE)

- ❖ Minimum:
- ❖ Long-sleeved shirt
- ❖ Long trousers or coveralls
- ❖ Gloves
- ❖ Shoes plus socks
- ❖ Hat

Protect Yourself!

Coveralls

- ❖ Wear loosely over clothing
- ❖ Zippers should be covered
- ❖ Two-piece: top should extend well below the waist and remain untucked



- ❖ Especially during mixing & loading
- ❖ Unlined and waterproof
- ❖ Check for holes
- ❖ If spraying overhead, tuck sleeves inside gloves...

Use Gloves!



... and fold the cuffs up

What is wrong with these gloves?



Lining can absorb pesticide!

Gloves reduce dermal exposure by **99%** when mixing, loading, and applying

of all body exposure during spraying is by skin contact!



Check the label

to determine if you need specific chemical-resistant gloves, and what kind

Personal Protective Equipment:
 Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category C on an EPA chemical-resistance category selection chart.

Applicators and other handlers must wear: Long-sleeved shirt and long pants; Chemical-resistant gloves, such as Barrier Laminate or Butyl Rubber, or Nitrile Rubber or Neoprene Rubber or Polyvinyl Chloride or Viton; Shoes plus socks; Protective eyewear when mixing or spraying; when performing maintenance or repairs (such as repairing/replacing hoses, cleaning, replacing or unplugging nozzles) on contaminated equipment or equipment containing residual carbofuran, or when cleaning the equipment or vehicle containing, or contaminated with carbofuran. For exposure in enclosed areas: A respirator with either an organic vapor-removing cartridge with a prefilter approved for pesticides (MSHA/NIOSH approval number prefix TC-23C), or a canister approved for pesticides (MSHA/NIOSH approval number prefix TC-14G), or a NIOSH approved respirator with an organic vapor (OV) cartridge or canister with any R, P or HE prefilter. For exposures outdoors: Dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C), or a NIOSH approved respirator with any R/P or HE filter.

Footwear

- ❖ No sandals or flip flops!
- ❖ Consider wearing unlined, rubber boots... even if not required
- ❖ Hang pant legs **outside** the boots!



Hats & Hoods

- ❖ Liquid-proof with a wide brim
- ❖ No absorbent materials!
- ❖ Chemical-resistant hoods on jackets



Protect your eyes when mixing concentrates or handling dusts or toxic sprays



Eyewear should have shields on all sides!



If goggles are required, so is access to an eyewash dispenser!



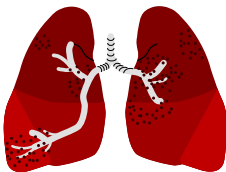
A portable eyewash is recommended for people in the field without access to a stationary eyewash

Respirators

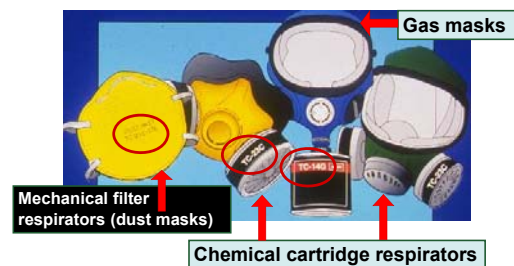
Prevent pesticide exposure through the respiratory system

When should a respirator be used?

- ❖ When the **label** requires it
- ❖ When exposed to spray mist
- ❖ When working in confined spaces
- ❖ When using dusts, gases, vapors, or fumigants



Air-purifying



Always select equipment approved by:

- ❖ National Institute of Occupational Safety and Health (NIOSH)
- ❖ Make sure the cartridge or filter is rated for the pesticide you are using
- ❖ Read the **label**



Use and Care of Respirators

- ❖ Fit-check and make sure it works before every use
- ❖ **MUST** have tight seal!
- ❖ Make sure valves are in proper working order
- ❖ Replace filters
 - ❖ Taste, smell
 - ❖ State regulations
 - ❖ Manufacturer recommendations



Get to Fresh Air Immediately if...

- ❖ You smell or taste contaminants
- ❖ Your eyes, nose or throat become irritated
- ❖ Your breathing becomes difficult
- ❖ The air you are breathing becomes uncomfortably warm
- ❖ You become nauseous or dizzy



PPE Clean Up!

- ❖ Discard disposables and worn-out items!
- ❖ **Wash at the end of each day, including gloves and all PPE**
- ❖ Launder pesticide clothing



Separate from family clothing



What should this guy do immediately after starting the washing machine?

Wash contaminated clothing in hot water with detergent

Laundering Pesticide Contaminated Clothing

- ❖ Use **heavy-duty liquid detergent for ECs**
- ❖ Use **2 cycles** for moderate to heavy contamination
- ❖ **Rinse the washer** with an "empty load"



Photodegradation

- ❖ Line dry if possible
- ❖ Breakdown of pesticides by sunlight photons = photodegradation



Keep all PPE separate from pesticides in storage!!



PPE Use

- ❖ Wear adequate PPE
 - ❖ When mixing
 - ❖ When applying
 - ❖ When doing equipment maintenance



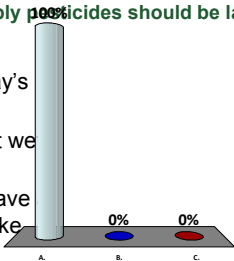
PPE Use

- ❖ If a nozzle becomes plugged during an application...
 - ❖ Do not remove your PPE!
 - ❖ Use an old toothbrush to clean the nozzle. Never try to blow it out with your mouth



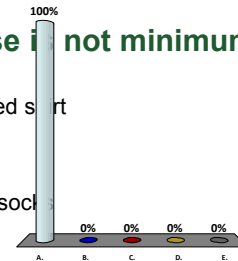
Work clothes worn to apply pesticides should be laundered with a suitable detergent:

- ✓ A. After each day's use.
- B. After they get wet with spray.
- C. When they have strong odor like the pesticide.



Which of these is not minimum PPE?

- ✓ A. Short-sleeved shirt
- B. Long-pants
- C. Gloves
- D. Shoes plus socks
- E. Hat



Acknowledgements

- ❖ Washington State University Urban IPM and Pesticide Safety Education Program authored this presentation
- ❖ Illustrations were provided by Nevada Dept. of Agriculture, University of Missouri-Lincoln, Virginia Tech., Washington Dept. of Agriculture, Washington State University
- ❖ 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 Drex Rhoades,

