

Pesticide Risk Assessment, Pesticide Labeling, and Protective Garments and Gloves



2019 Photo: Carol Black during Weyerhaeuser Tour

Carol Black

Washington State University

Urban IPM & Pesticide Safety Education

**3rd Annual PNW
Forest Vegetation Management
Conference - 2019**



Good Morning



Carol Black
Pesticide Education
Specialist

Washington State
University

33 years conducting
pesticide education

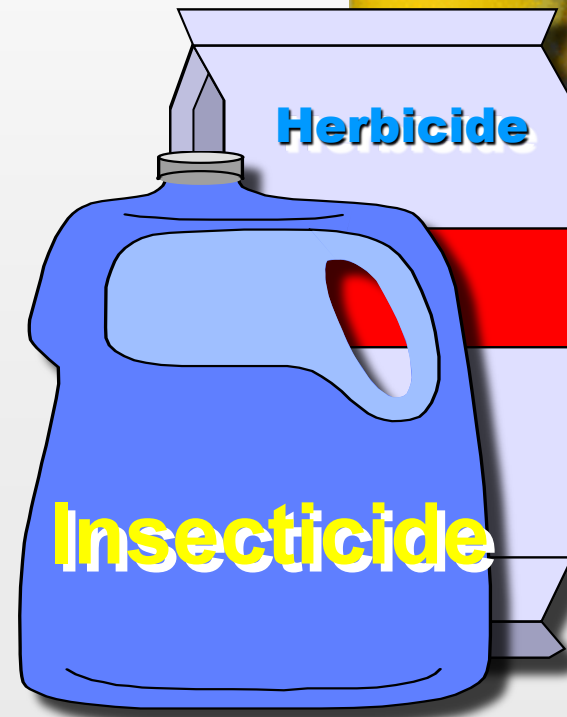
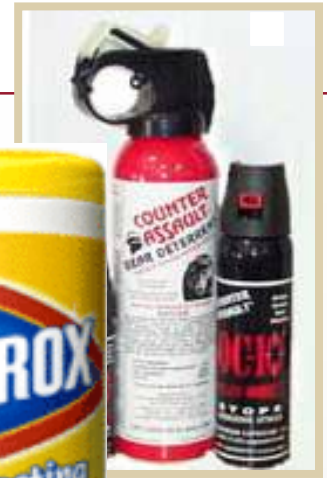
Specialized in
spray drift and PPE





Pesticide Definition for My Talk

- Insecticides, herbicides, fungicides
- Miticides, avicides, rodenticides
- Molluscicide
- Algaecides
- Disinfectants, sanitizers
- Sprout inhibitors
- Thinners
- If it claims management of any organism, must be registered!

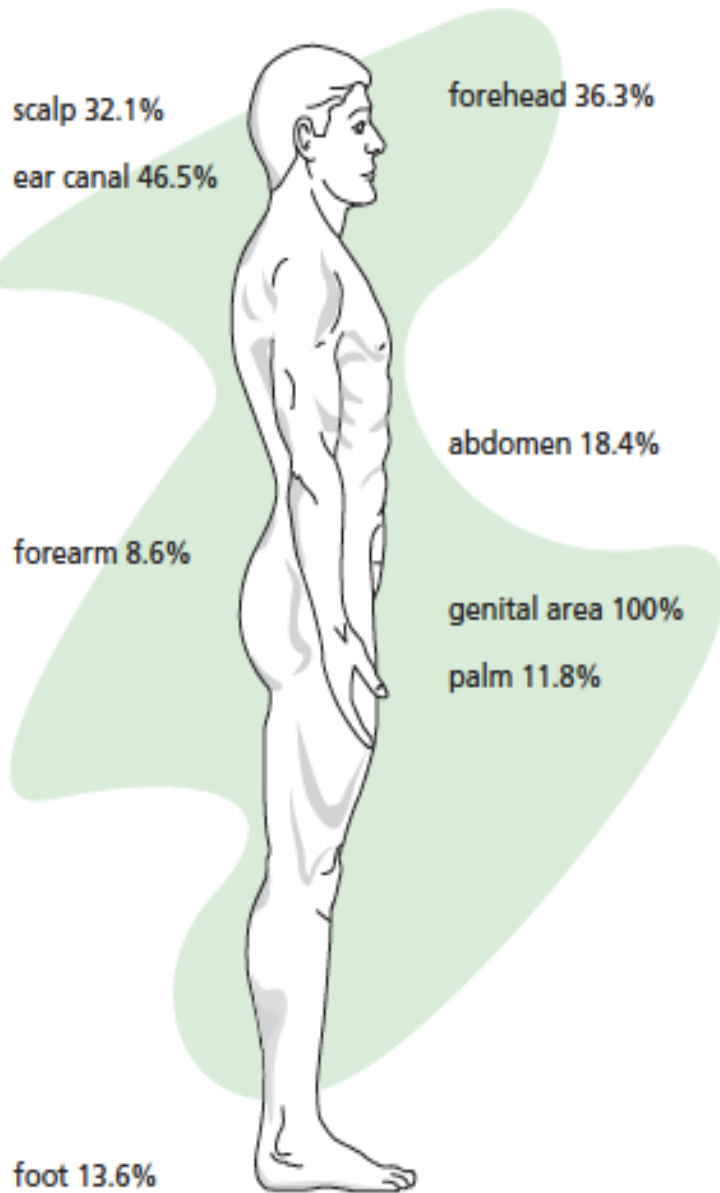




Protecting Mixer/Loaders and Applicators

- EPA Risk Assessment
 - From Jeff Dawson, EPA
- Pesticide Labeling and PPE



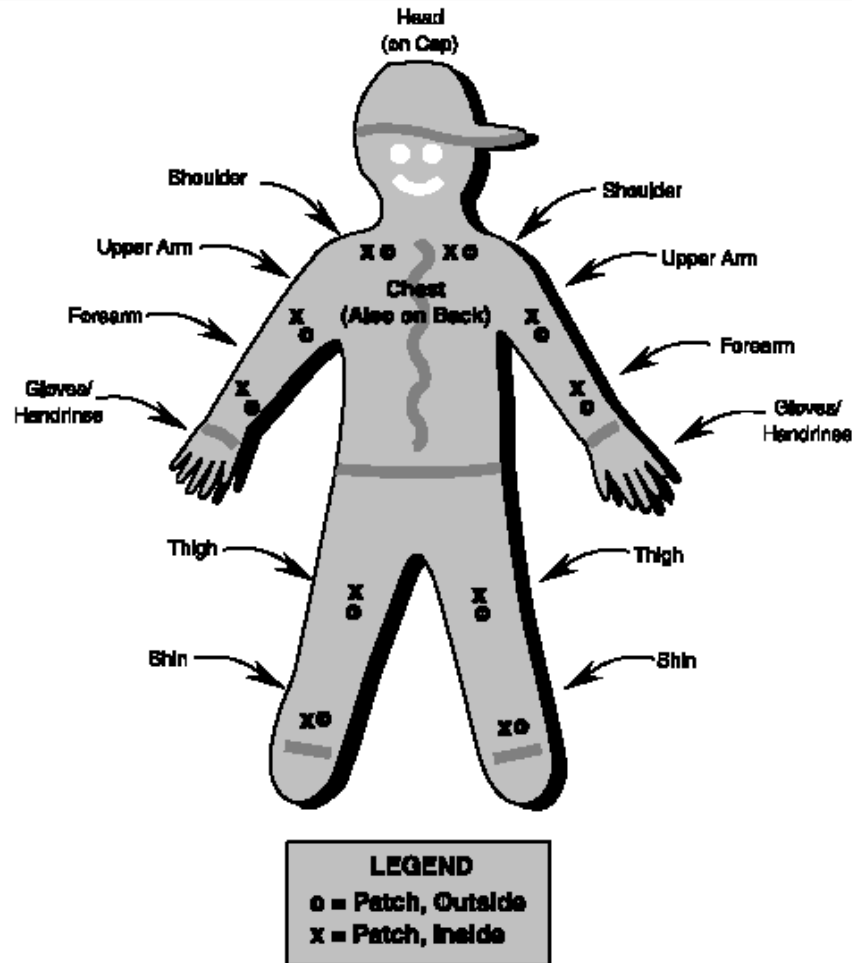


Dermal Risk Assessment for Occupational Users

- **Risk** = **Toxicity** x **Exposure**
- Risk assessment defines labeling language
 - Protective garments and gloves
 - Engineering controls
- Other exposures considered
 - Food, water, residential, post-application workers
- Risk assessments completed using task-based scenarios



Monitoring Data - Patch Method



Citation: Durham & Wolfe (1962)
Measurement Of The Exposure Of Workers To Pesticides,
Bulletin of the WHO 26:75-91



Dermal Sampling

Diagram of Inner Dosimeter



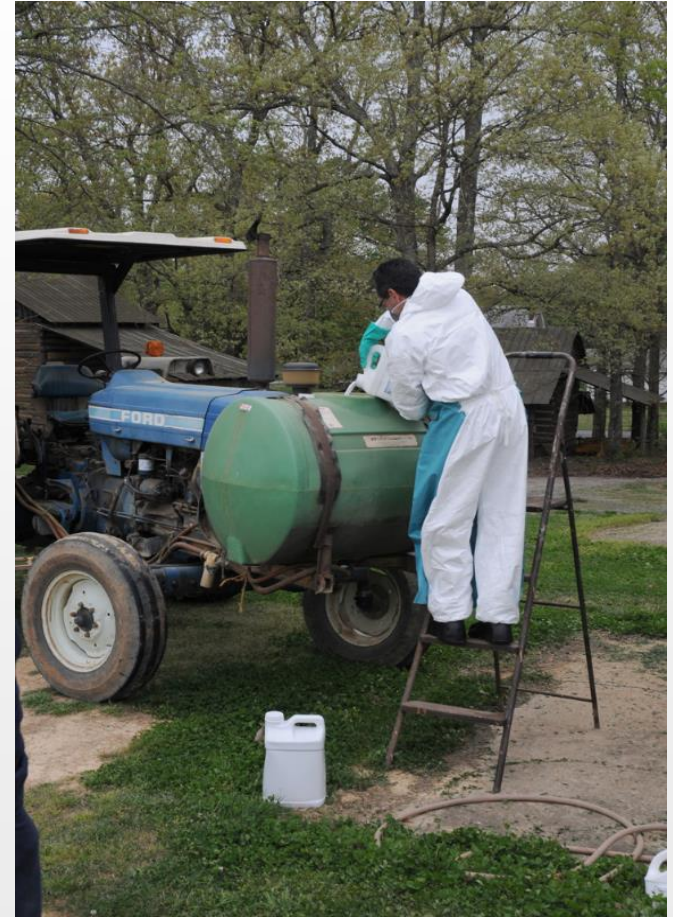


Actual Exposures & PPE Use





Miscellaneous Mixing/Loading











Aerial Application





Closed Cab Granular





Foliar applications by groundboom – open cab







Foliar applications by groundboom – enclosed cab









PHED Scenario 11. Airblast Open Cab





Airblast sprayer







PHED Scenario 12. Airblast: Enclosed Cab





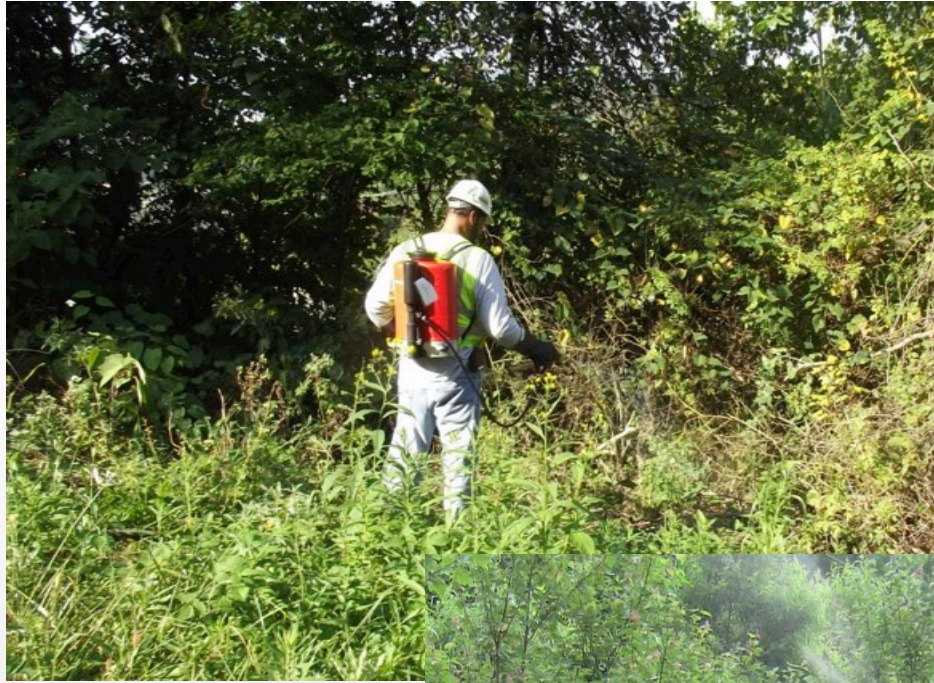
Backpack Sprayer





Backpack applications: right of way, turf, landscape, forestry







PHED Scenario 18 and 32. Low Pressure Handwand (32 includes mixing/loading)





Low Pressure/ High Volume Handgun





PHED Scenario 30. Belly Grinder





Greenhouse



Photo not
from the US



Closed Mix/Load Systems



Water Soluble
Packets

*Packets containing
dry flowable
product*





Monitoring Data - Dosimetry Method



Citation: World Health Organization (1982) *Field Surveys of Exposure to Pesticides*, Standard Protocol VBC/82.1 WHO, Geneva



Patches are Extrapolated to Representative Surface Areas

- Some examples
- Surface Area (cm^2), 50th percentile man
 - Head, 1300
 - Face, 650
 - Neck, 260
 - Chest, 3550
 - Back, 3550
 - Upper arm 2900



Monitoring Data Hand Exposures

Trapping Method:
(e.g., gloves)



Removal Method:
(e.g., various washes)





Face/Neck Wipe Technique





Types of PPE for the Task





PPE Mitigations for Risk Management

Mixer/loader *at greatest risk*



*Occupational Handler
(Mixer/Loader) with
coveralls, respirator, and
gloves*

***Engineering Controls-
closed system mixing
and loading, apron,
respirator, and gloves***





Application Rates Modify PPE Requirements during Assessment

Turf Type	Residential and Commercial Turf ³		Golf Course Fairways (Cut at 0.5" or less)	
	fl. oz./1,000 sq. ft.	fl. oz./A	fl. oz./1,000 sq. ft.	fl. oz./A
Cool-Season				
Bentgrass	0.75	33	0.25	11
Fescue, Red	0.75	33		
Fescue, Tall (Ky-31)	1.0	44		
Fescue, Tall (Turf Types)	0.75	33		
Kentucky Bluegrass	0.60	26	0.25	11
Mixture (Bentgrass/ <i>Poa annua</i>)			0.25 ⁵	11
Mixture (K. Bluegrass/ Fescue/Ryegrass)	0.75	33		
Mixture (K. Bluegrass/ Ryegrass/ <i>Poa annua</i>)			0.50 ⁵	22
Ryegrass, Annual	1.0	44		
Ryegrass, Perennial	1.0	44	0.50	22



Risk Assessment – MATH for EPA

Application rate, Treated area size, Dose/day,
Body size, Absorption rate, Exposure

$$\text{Exposure (mg/day)} = \text{Application Rate} \times \text{Area Treated} \times \text{Unit Exposure}$$

$$\text{Dose (mg/kg – day)} = \frac{\text{Exposure} \times \% \text{ Absorption}}{\text{Body Weight}}$$

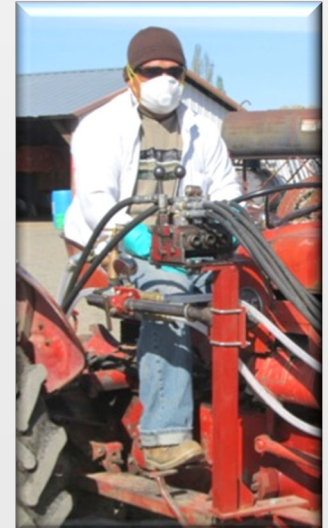
$$\text{MOE} = \frac{\text{PoD (mg/kg – day)}}{\text{Dose (mg/kg – day)}}$$





Risk Assessment Results

- MOE – Margin of exposure
 - allows EPA to rank risks based on actual toxicity and EXPOSURE
- Additional uncertainty factors added
 - animals and humans differ (10x)
 - people differ (10x)
 - others added (10x - due to lack of data)
- Math comes out as
 - “not of concern”
 - “risks are of concern” – MUST MITIGATE





How is Toxicity Considered

- Evaluate toxicological data for concerns
 - neurotoxicity
 - reproduction
 - developmental
 - cancer
 - metabolism
- Consider different **effects**, **durations**, and **routes** (e.g., skin or inhaled)
- Decisions based on **most protective measures**





Use-Scenario Defines Exposure

- Who/what/where/how much/# of acres?
- Used to define the scope of an assessment
- Label uses are considered to ensure they are addressed
- Typical use information also considered to reflect common practices



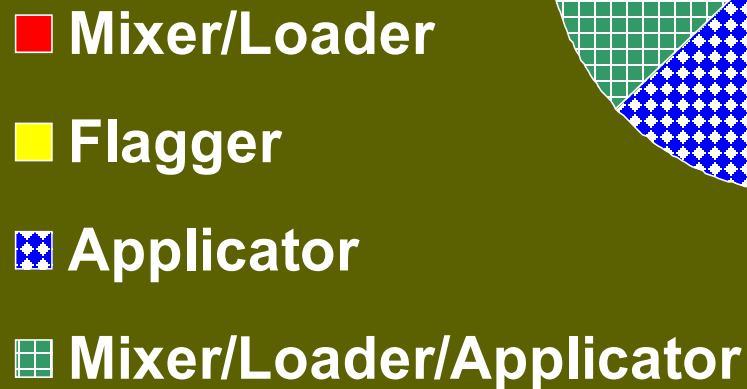
Unit Exposures

- Way of expressing how much exposure occurs within a given use-scenario
 - Values for
 - How much gets on the skin (dermal)
 - How much can be breathed in (inhalation)
 - Function of
 - Equipment
 - Task
 - How much is handled
 - Use of protective clothing and/or equipment
- ****



Pesticide Handler Exposure Database (PHED)

- PHED developed by EPA, Health Canada, California DPR and Industry (V1.1-1995)



1712 monitored workers



The Pesticide Label

- Risk Assessment
 - Toxicity
 - Formulation
 - Use pattern
 - Dermal exposure
 - Inhalation exposure
 - Closed-mixing systems



VERY RARELY would this much protection be warranted, and extremely doubtful being a solid formulation



Defining Labeling Language Based on Acute Toxicity (40 CFR 156.212)

Acute Toxicity Category	WPS-Required <u>Dermal</u> PPE
Toxicity Category I Danger	Acute Dermal and Acute Dermal Irritation : Coveralls, long sleeved shirt, long pants, gloves, apron, headgear
Toxicity Category II Warning	Based on Acute Dermal and Acute Dermal Irritation : Coveralls, short sleeved shirt, short pants, gloves, apron, headgear
Toxicity Category III Caution	Based on Acute Dermal and Acute Dermal Irritation : Long sleeved shirt, long pants, gloves
Toxicity Category IV Caution	Based on Acute Dermal and Acute Dermal Irritation : Long sleeved shirt, long pants

Chemical-resistant garments – **almost never**

Dual layer covering skin

Single layer covering skin



EPA Matrix for PPE: **Dermal** & **Inhalation** Toxicity

Other factors, in addition to default acute toxicity values, are used.

Type of PPE	Certification Requirements* Not in EPA matrix	Minimum Required	Next Highest Level of Protection	Next Highest Level of Protection	Highest Level of Protection
Protective Clothing	None	Long-sleeved shirt and long pants	Coveralls over short-sleeved shirt and short pants	Coveralls over long-sleeved shirt and long pants	Chemical-resistant suit
Protective Footwear	None	Socks and Shoes	Chemical-resistant footwear	Chemical-resistant footwear	NA
Gloves	None	None	Based on solvents – waterproof or solvent-protective gloves		
Protective Headwear	None	None	Chemical-resistant headgear	NA	NA
Chemical Resistant Apron	None	None	Chemical-resistant apron worn over coveralls over short-sleeved shirt and short pants	Chemical-resistant apron worn over coveralls over long-sleeved shirt and long pants	NA
Respiratory Protection Device	NIOSH Certified	None	Particulate filtering respirator: NIOSH approval number prefix (TC-21C) or a NIOSH approved respirator with any R,P, or HE filter	A respirator with an organic-vapor removing cartridge with a prefilter approved for pesticides	Air Supplying Respirator



The Pesticide Label

Lorsban 4E (2012)
INSECTICIDE

- Who is Exposed?
- Mixer-loaders
- Applicators
- Equipment maintenance
- PPE is noted on the label per task

Personal Protective Equipment (PPE)

Materials that are chemical resistant to this product are barrier laminate and viton ≥ 14 mils.

Mixers and loaders using a mechanical transfer loading system and applicators using aerial application equipment must wear:

- Long-sleeved shirt and long pants
- Shoes and socks

In addition to the above, **mixers and loaders** using a mechanical transfer loading system must wear:

- Chemical-resistant gloves
- Chemical-resistant apron
- A NIOSH-approved dust mist filtering respirator with MSHA/NIOSH approval number prefix TC-21C or a NIOSH-approved respirator with any R, P, or HE filter

See Engineering Controls for additional requirements.

All **other mixers, loaders, applicators and handlers** must wear:

- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant gloves
- Chemical-resistant apron when mixing or loading or exposed to the concentrate
- Chemical-resistant footwear plus socks
- Chemical-resistant headgear for overhead exposure
- A NIOSH-approved dust mist filtering respirator with MSHA/NIOSH approval number prefix TC-21C or a NIOSH-approved respirator with any R, P, or HE filter.



PPE label-language database was developed by Dr. Anugrah Shaw to obtain information that would assist in **determining the scope of the issue** with the current PPE requirements on the label.



UNIVERSITY *of* MARYLAND
EASTERN SHORE



Personal Protective Equipment

- Clothing



- Eye Protection



- Gloves

- Respiratory

Protection





All PPE images taken from [gemplers.com](https://www.gemplers.com) and [amazon.com](https://www.amazon.com)

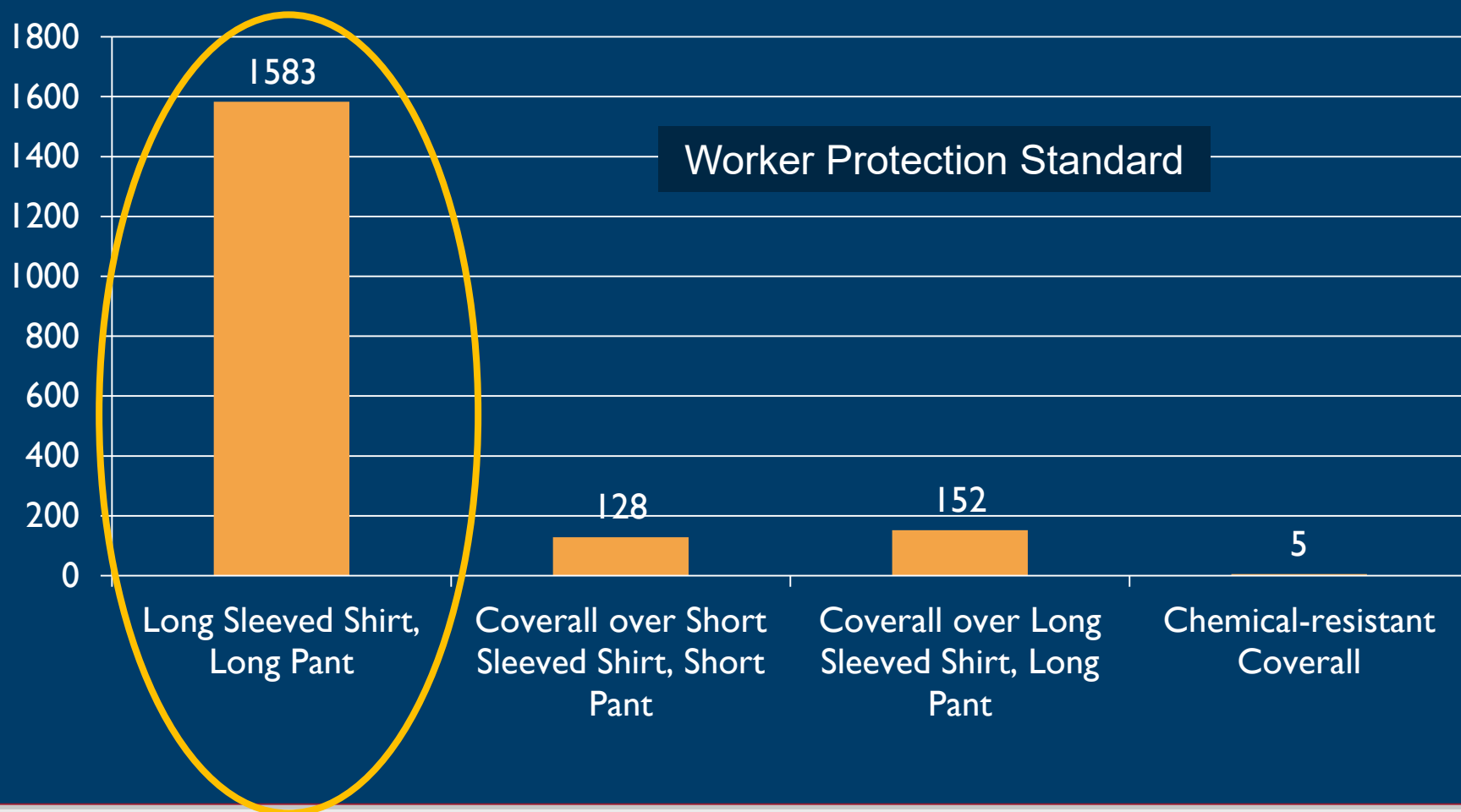
Protective Clothing

Protective Clothing Requirements by Garment Type (National)

Dr. Anugrah Shaw, UMES

Journal of Pesticide Safety Education 2013:15: 17-19

1868 US pesticide labels analyzed





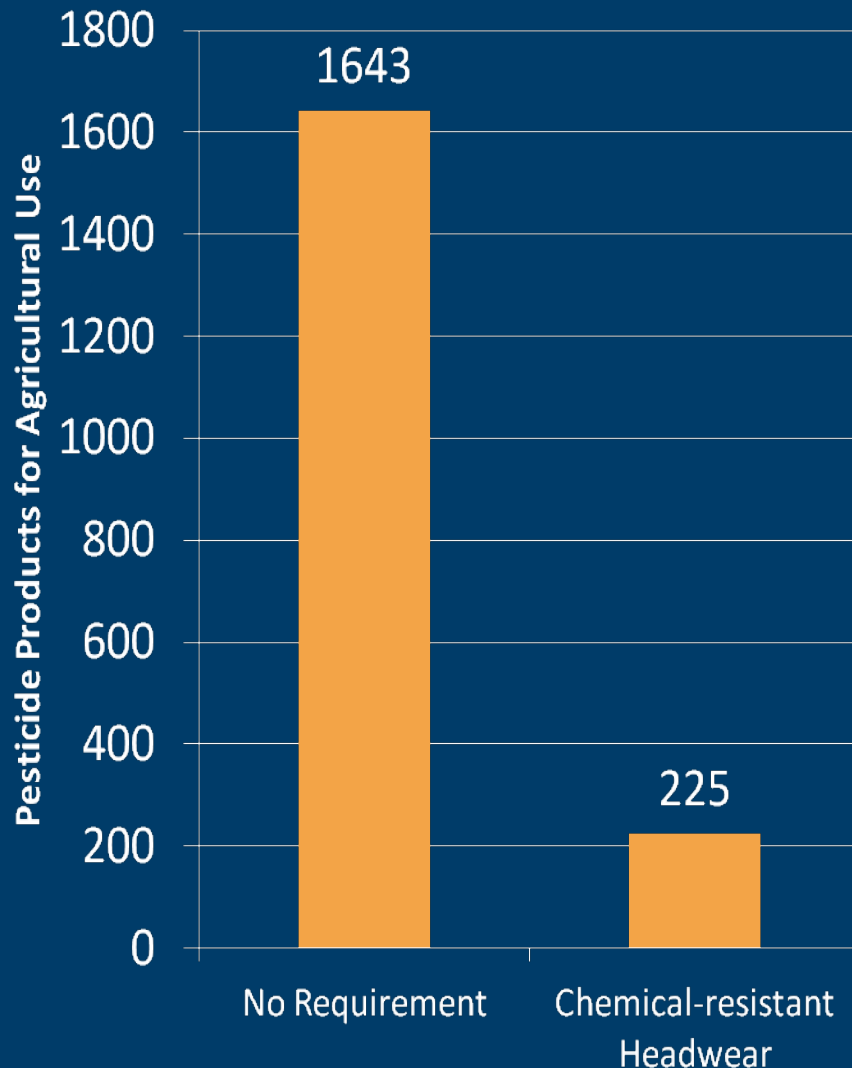
Protective Clothing

- Clothing label language is based on **garment type** and **layers of garments**
 - not any scientific garment/fabric standard.
- Fabric performance varies considerably
 - Material and the finish applied to the fabric
 - Pant/shirt can provide better protection than some coveralls
- ASTM and ISO performance-based standards for fabrics/finishes
 - Wear studies needed prior to US implementation
 - Used in Europe and Brazil



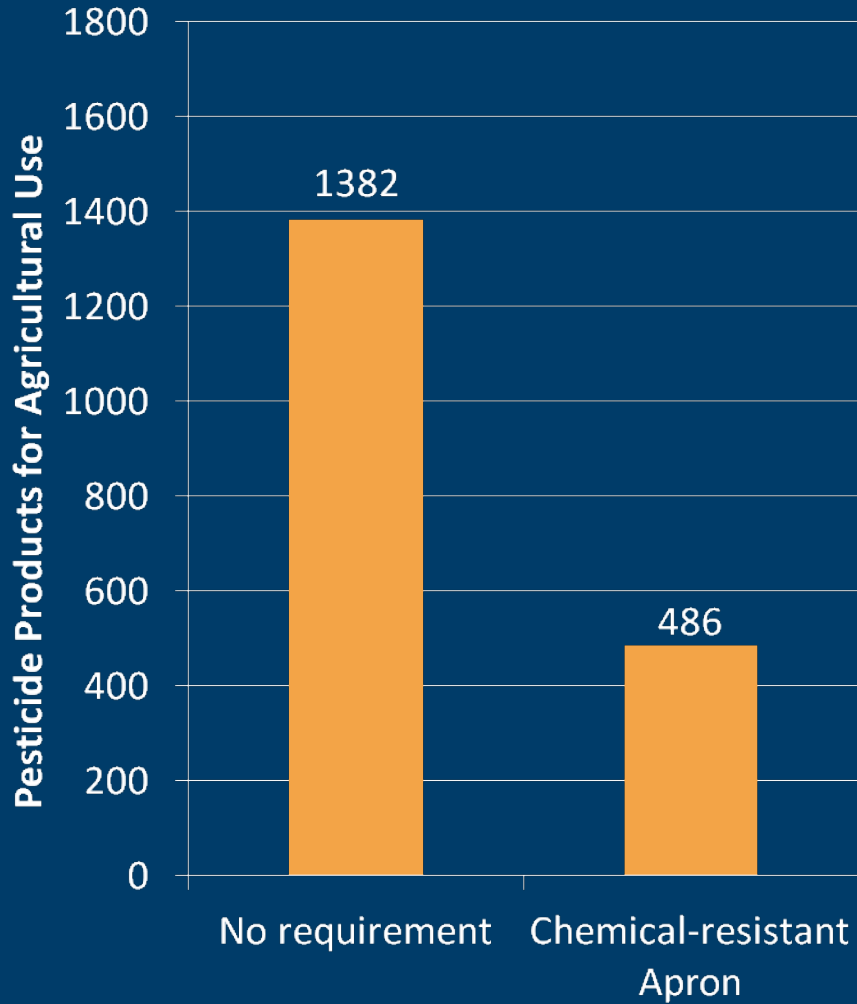
Protective headwear, aprons, and footwear

Protective Headwear Requirements



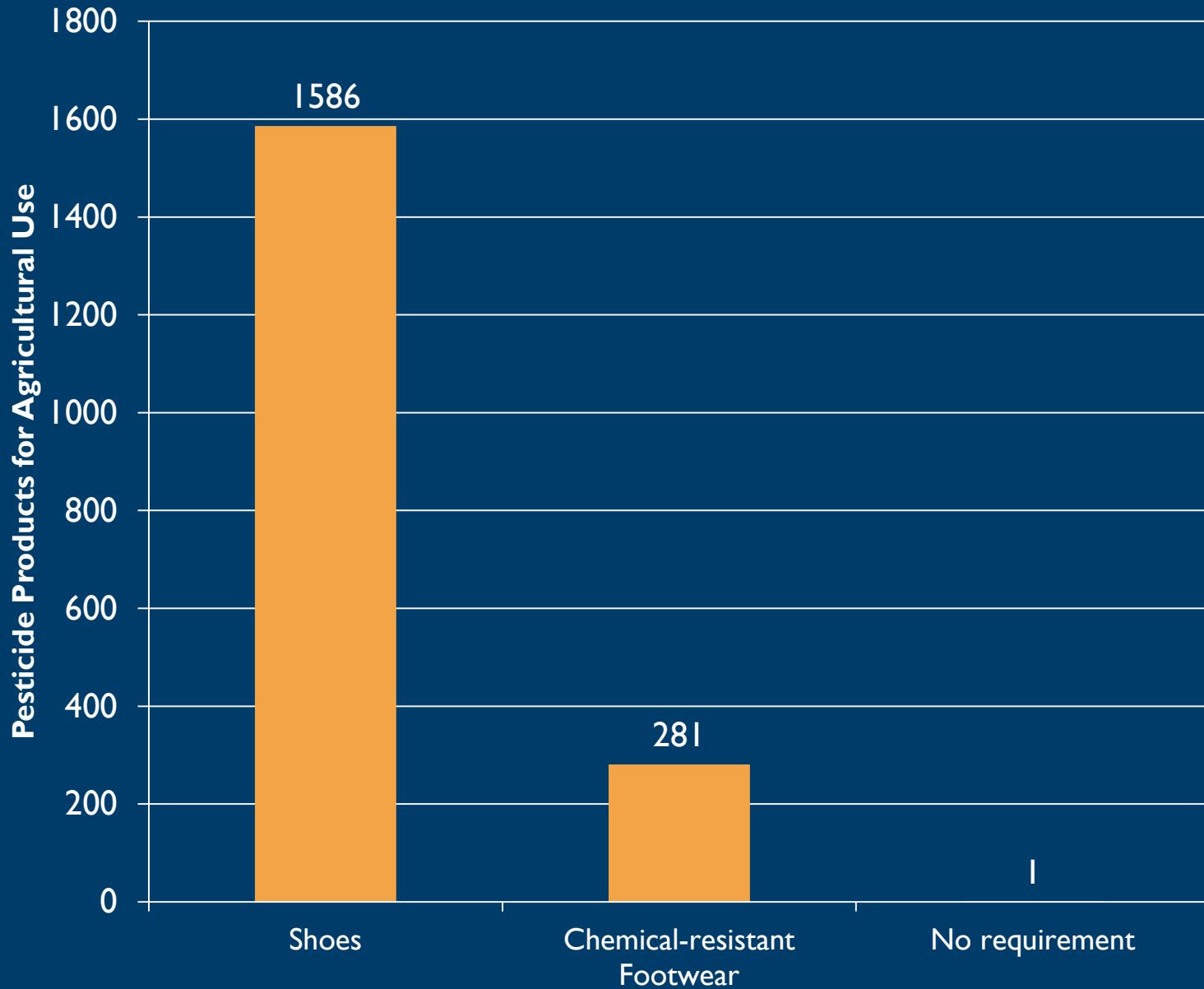
- Headwear is required for **Dermal Toxicity Category I or II products that might involve overhead exposure.**
- 48 labels that require headgear require long-sleeved shirt and long pants
 - the lowest level of protection for the rest of the body.
- Rain suits/chemical resistant suits are often worn for orchard spraying where not only the head but the entire back is wet from exposure.

Apron Requirements for Mixing, Loading or Repairs



A chemical-resistant apron is required for certain products with **Derma Toxicity Category I or II and/or Skin Irritation.**

Protective Footwear Requirements

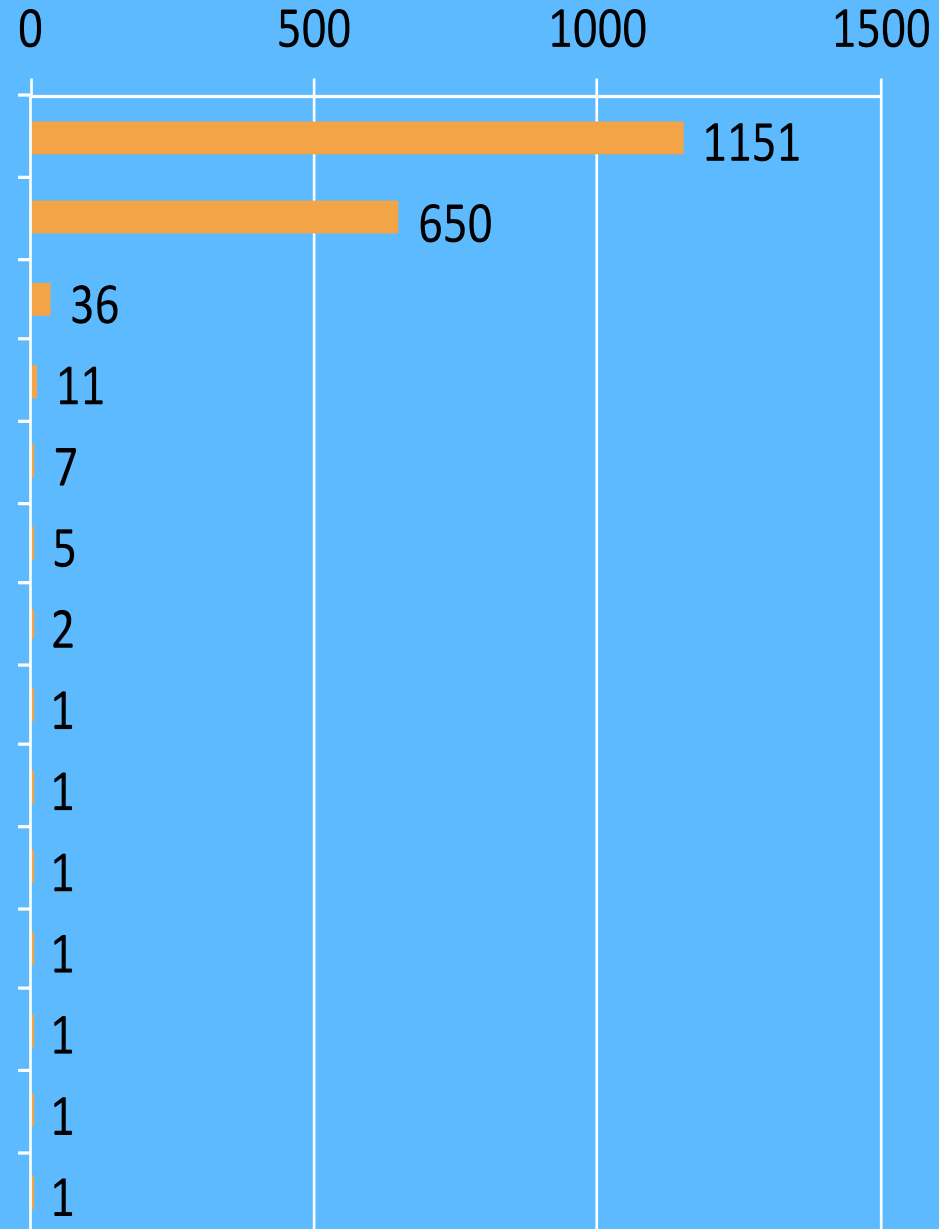




Protective Eyewear

Protective Eyewear Requirements

Pesticide Products for Agricultural Use



Protective eyewear
is required for
Toxicity
Categories I and II



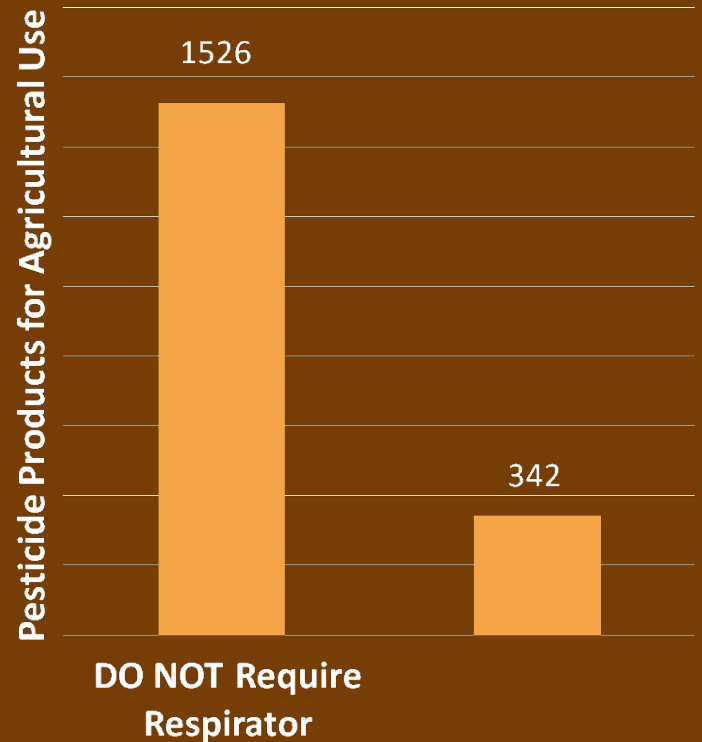
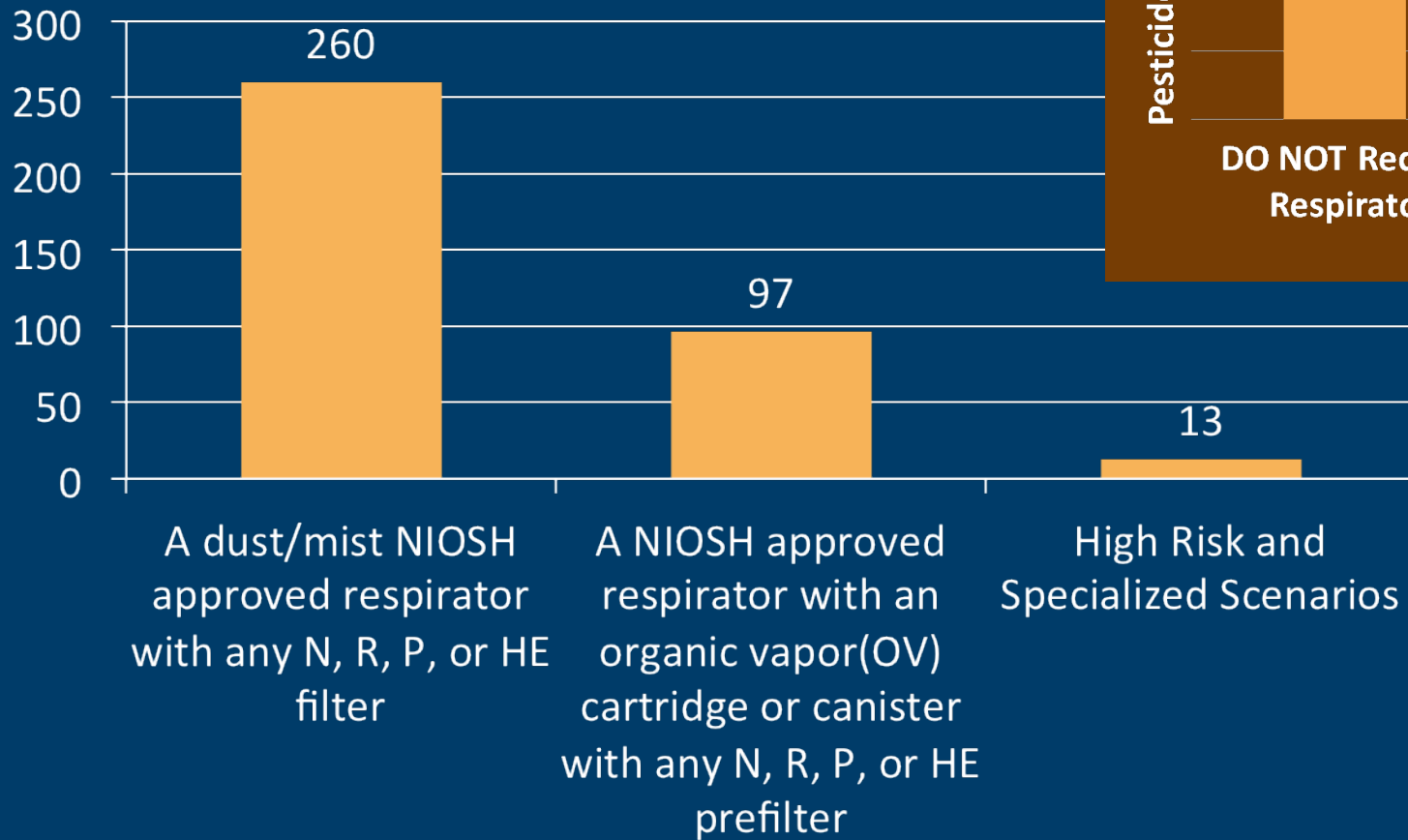
cdc.gov

Respiratory Protection

Respirator Requirements



Respirator Types





Protective Gloves



Nitrile

Barrier Laminate



Butyl Rubber



PVC
polyvinylchloride



Polyethylene



Viton

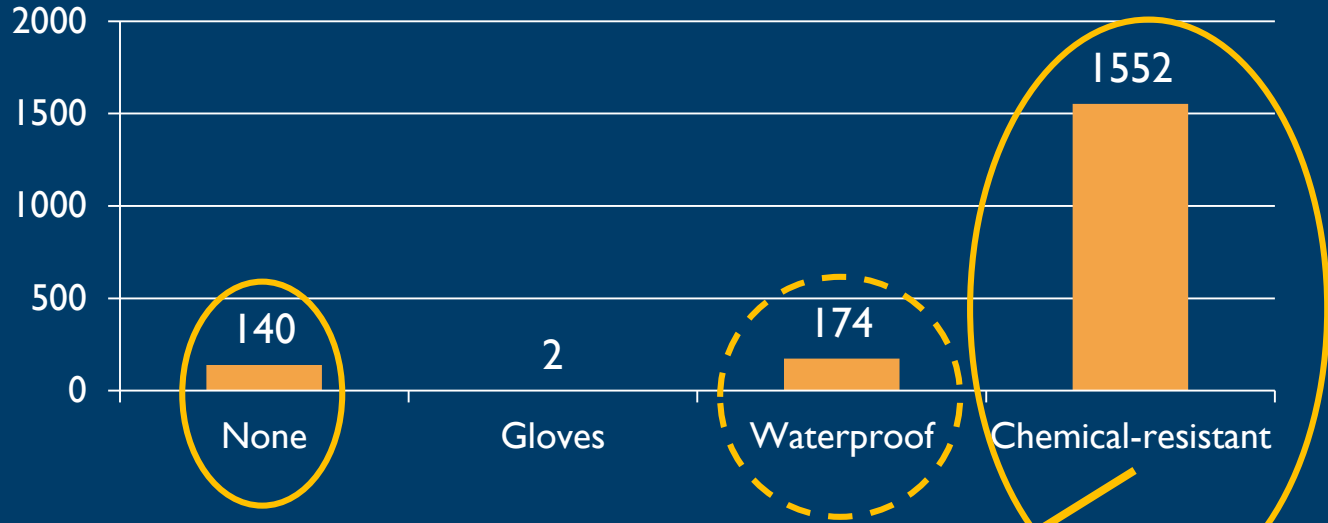


Neoprene

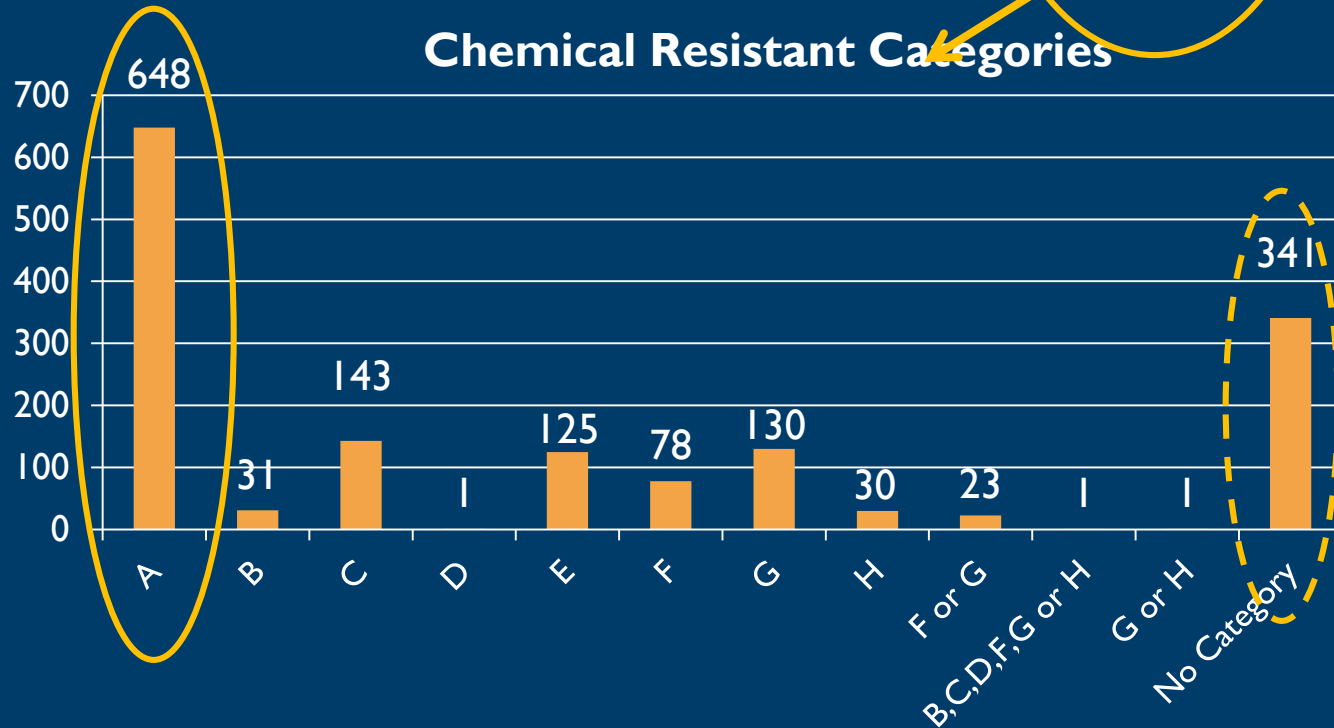
All PPE images taken from
gemplers.com and amazon.com

from Dr. Anugrah Shaw, UMES
1868 labels analyzed from CDMS in 2012

Glove Requirements



Chemical Resistant Categories





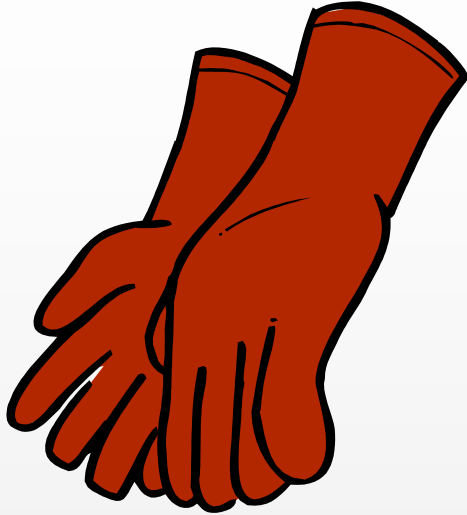
EPA Glove Type Selection

- Best matches the handling task duration
- Based on **solvents** used in pesticides, **not the pesticides themselves**
- Two formulations of the same active ingredient may require different glove types





Gloves – The Beginning



- A.D. Little and EPA/ORD
- 100 tests
- 20 pesticide formulations
- 13 glove materials

- Permeation Resistance of Glove Materials to Agricultural Pesticides
- 1993 - Guidance Manual for Selecting Protective Clothing for Agricultural Pesticides Operations
 - A.D. Little, peer-reviewed by EPA



Gloves – The Basis

- Solvents generally permeate first*
- Labels are based on solvent types
- Labels **should list TYPE of glove**, not code
- Label - means gloves can be worn **all day**

Carrier Solvent	Selection Category Type
No solvent or aqueous solvent	A -- <i>waterproof</i>
Ketones	B
Alcohols	C
Acetates	D
Aliphatic Petroleum Distillates	E
Aromatic petroleum Distillates < 40%	F
Aromatic petroleum Distillates > 40%	G
Halogenated Hydrocarbons	H



Labels are being updated to state:
Wear (ONLY is my notation)

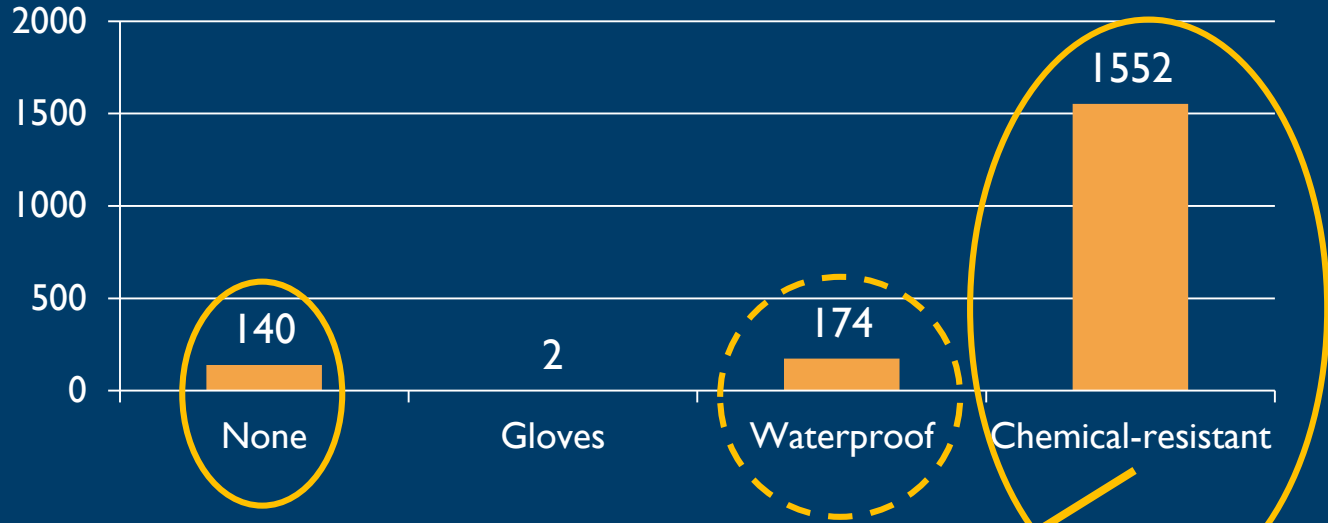
REFERENCE CHART FOR GLOVES*

Category A	Any waterproof material
Category B	ONLY butyl rubber or barrier laminate
Category C	Butyl rubber, nitrile, neoprene, polyvinyl chloride, barrier laminate, or Viton®
Category D	ONLY butyl rubber or barrier laminate
Category E	Nitrile, neoprene, barrier laminate, or Viton®
Category F	Butyl rubber, nitrile, barrier laminate, or Viton®
Category G	ONLY barrier laminate or Viton®
Category H	ONLY barrier laminate or Viton®

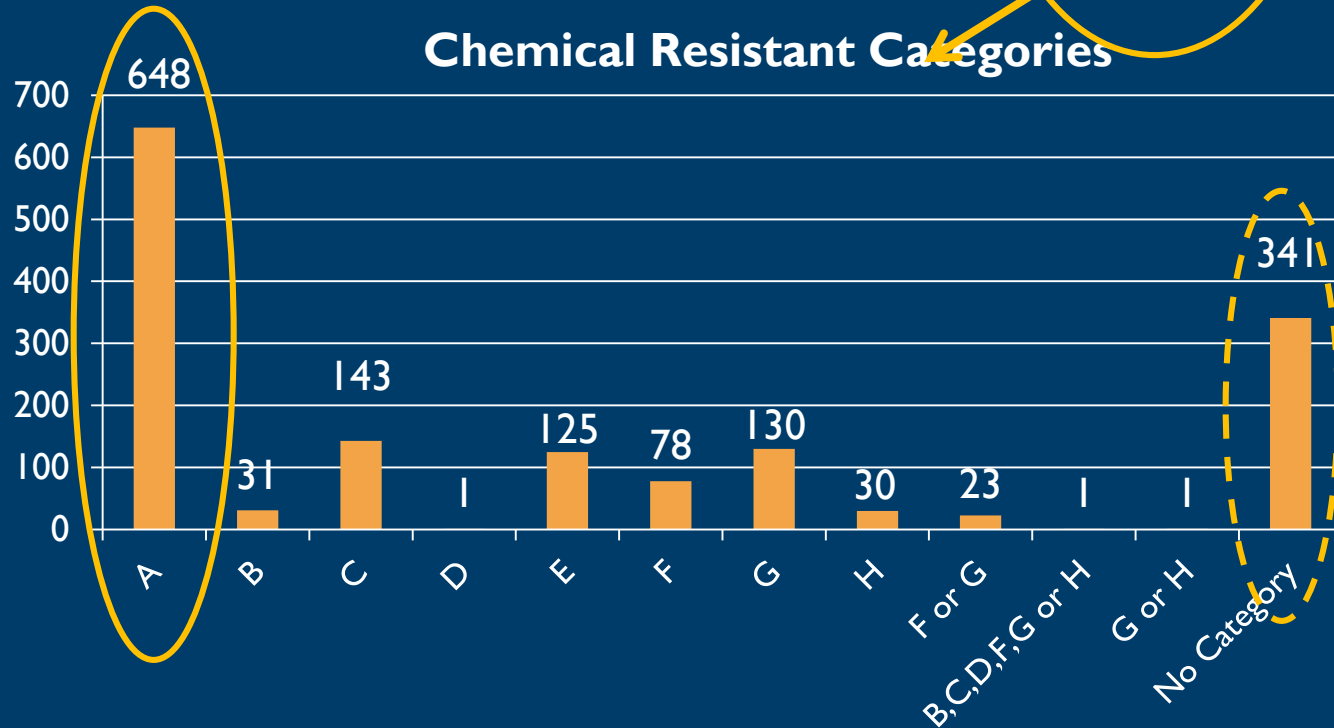
**Two or more hours contact*

from Dr. Anugrah Shaw, UMES
1868 labels analyzed from CDMS in 2012

Glove Requirements



Chemical Resistant Categories





Barrier Laminate



PVC
polyvinylchloride

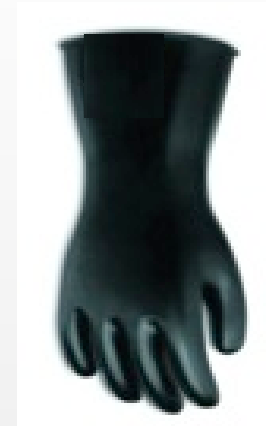


Nitrile

**Glove
Materials**



Polyethylene



Viton



Butyl Rubber



Neoprene



Latex® 20 mil



Nitrile 8 mil

Glove Thicknesses

Nitrile 15 mil



Disposable vinyl



Nitrile 5 mil



Applicator – Glove Statements - Herbicides

- Roundup Weather Max – (2009)
 - Any waterproof material such as polyethylene or polyvinyl chloride
- Weedar 64 (2010)
 - Some materials that are chemical resistant are listed below **(NOT)**. For more options, follow instructions for **Category A** on an EPA Chemical Resistance Chart.
- Cimarron Max (2011)
 - Some materials that are chemical resistant to this product are butyl rubber, natural rubber, neoprene, or nitrile rubber. . . . For more options, follow instructions for **Category A** on an EPA Chemical Resistance Chart.
- Bonfire Herbicide (2011)
 - Chemical resistant gloves – **Category A** (e.g. barrier laminate, butyl rubber, nitrile rubber, neoprene rubber, natural rubber, polyethylene, polyvinyl chloride (PVC) or viton)



Applicator – Glove Statements - Insecticides

- Brigade (2008)
 - Wear chemical resistant gloves, such as Barrier Laminate, Nitrile Rubber, or Neoprene Rubber, or Viton
- Sevin 4F (2010)
 - Some materials that are chemical resistant to this product are made of any waterproof material. . . . For more options, follow instructions for Category A on an EPA Chemical Resistance Chart. . . . Wear chemical resistant gloves.
- Lorsban Advance (2012)
 - Materials that are chemical resistant to this product are barrier laminate or viton >14mils Must wear chemical resistant gloves.

Wear --- Any --- Such as --- e.g.,



Barrier Laminate



PVC
polyvinylchloride



Nitrile

**Review of
Glove
Materials**



Polyethylene



Viton



Butyl Rubber



Neoprene



What
glove
do
you wear
most
often?

1. Polyethylene (food handling)
2. Natural rubber (latex)
3. Polyvinyl chloride (PVC)
4. Nitrile - reusable
5. Nitrile - disposable
6. Neoprene - reusable
7. Neoprene - disposable
8. Butyl rubber
9. Viton





New Studies Underway to Enhance Risk Assessment and Protections



- Different glove types
- Different thicknesses of gloves
- Formulations and solvents
- Duration of tasks and exposure
- User input – Questions from TODAY!

Registrants
and EPA
need to get
involved!



web.extension.illinois.edu



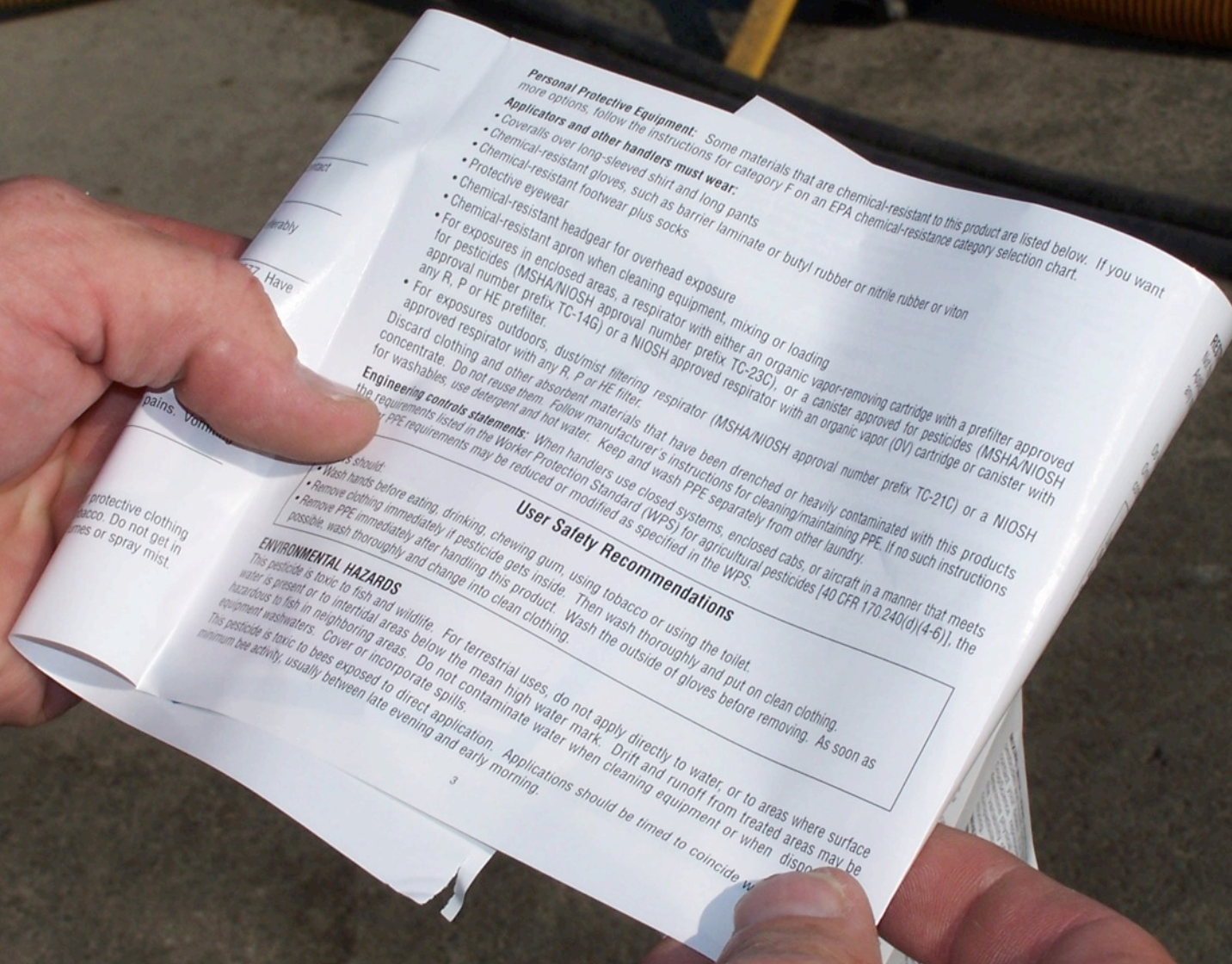
nmda.nmsu.edu



Recent Updates to Guidelines for EPA

Type of PPE	Certification Requirements	Minimum Required	Next Highest Level of Protection	Next Highest Level of Protection	Highest Level of Protection
Protective Clothing	Double Layer of Coveralls – based on cotton or cotton/polyester				
Protective Footwear	None	Socks and Shoes	Chemical –resistant footwear	Chemical-resistant footwear	NA
Gloves	Waterproof or specifically noted glove types – labels need to be updated to meet this!				
Protective Headwear	None	None	Chemical Resistant headgear		NA
Chemical resistant Apron	None	None	Chemical Resistant apron worn over long-sleeved shirt and long pants		NA
Respiratory Protection Device	NIOSH Certified	None	Filtering facepiece respirator (N95, R95, or P95) ¹	Elastomeric Half Mask respirator with appropriate cartridges and/or filters	Air Supplying Respirator
Labels are being updated to current language					

Read the Label Carefully - Review Annually



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 F on an EPA chemical-resistance category selection chart.

Applicators and other handlers must wear:

- Coveralls over long-sleeved shirt and long pants
- Chemical-resistant gloves, such as barrier laminate or butyl rubber or nitrile rubber or viton
- Protective-resistant footwear plus socks
- Chemical-eyewear
- Chemical-resistant headgear for overhead exposure

- For exposures 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.

Discard clothing and other absorbent materials that have been drenched or heavily contaminated with this product's concentrate. Do not reuse them. Follow manufacturer's instructions for cleaning/maintaining PPE. If no such instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Engineering controls statements: When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides (40 CFR 170.240(d)(4-6)), the PPE requirements may be reduced or modified as specified in the WPS.

User Safety Recommendations

- 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.

ENVIRONMENTAL HAZARDS

This pesticide is toxic to fish and wildlife. For terrestrial uses, do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Drift and runoff from treated areas may be hazardous to fish in neighboring areas. Do not contaminate water when cleaning equipment or when disposing of equipment washwaters. Cover or incorporate spills.

This pesticide is toxic to bees exposed to direct application. Applications should be timed to coincide with minimum bee activity, usually between late evening and early morning.

What do labels say for forestry?



SPYDER[®]

Selective Herbicide

Dispersible granules for both preemergence and postemergence control of many annual and perennial grasses and broadleaf weeds; conifer and hardwood site preparation and release; general weed control in noncrop industrial sites; and other herbicides for use in fore

ACTIVE INGREDIENT:

Sulfometuron methyl (Methyl dimethyl-2-pyrimidinyl)amino amino]sulfonyl]benzoate)

OTHER INGREDIENTS:

Pesticides -- PPE Language

PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS CAUTION

Causes (moderate) eye injury (irritation). Avoid contact with eyes or clothing.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear: Long-sleeved shirt, long pants and shoes plus socks.





Dow AgroSciences

Gallery[®]

75 Dry Flowable

Herbicide

A preemergence herbicide for control of certain broadleaf weeds in:

- Established Turfgrass
- Landscape Ornamentals
- Container Grown Ornamentals
- Field Grown Ornamentals
- Groundcovers/Perennials
- Non-Cropland
- Ornamental Bulbs
- Non-Bearing Fruit and Nut Trees and Non-Bearing Vineyards
- Christmas Tree/Conifer Plantations

Active Ingredient:

isoxaben: N-[3-(1-ethyl-1-methylpropyl)-5-isoxazolyl]-
2,6-dimethoxybenzamide and isomers75%

Other Ingredients25%

Total100%

Contains 0.75 lb active ingredient per pound.

U.S. Patent Nos. 5,086,184 and 4,636,243

Keep Out of Reach of Children
CAUTION

Pesticides -- PPE Language

Applicators and handlers must wear:

- Long sleeved shirt and long pants
- Shoes plus socks





ELEMENT™ 4

Pesticides -- PPE
Language

AmTide MSM 60 DF Herbicide

DuPont™
Escort® XP

herbicide

Dry Flowable

Applicators and handlers
must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks





Applicators and handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- Protective eyewear

Pesticides -- PPE Language

DuPontTM

Velpar[®] DF

herbicide

Dispersible Granules

DuPontTM

Velpar[®] L

herbicide

Water Dispersible Liquid





DuPont™ Oust® XP

HERBICIDE

DuPont™

Oust® Extra

herbicide

Dispersible Granules

Some materials that are resistant to this product are **polyethylene or polyvinyl chloride**. If you want more options, follow instructions for **Category A** on an EPA chemical resistant category selection chart.



Applicators and handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks

No Glove Requirement in bullets



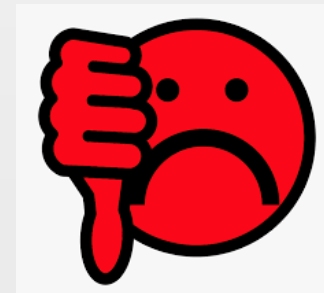
Some materials that are resistant to this product are listed below. If you want more options, follow instructions for **Category A** on an EPA chemical resistant category selection chart.

Applicators and handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- **Chemical resistant gloves** made of **any waterproof material**, such as **polyethylene** or **polyvinyl chloride**.



*Specially formulated
for Roundup Ready® crops*





Applicators and handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks





Pesticides -- PPE Language



Applicators and handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- **Chemical resistant gloves**
- Protective eyewear

What TYPE
of gloves?

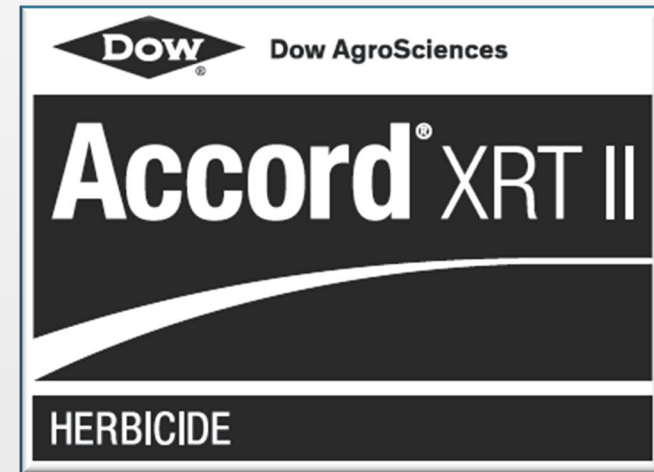


Some materials that are resistant to this product are listed below. If you want more options, follow instructions for **Category A** on an EPA chemical resistant category selection chart.



Applicators and handlers must wear:

- Long-sleeved shirt and long pants
- **Chemical resistant gloves** made of any waterproof material, such as **natural rubber**
- Shoes plus socks





Some materials that are resistant to this product are **natural rubber \geq 14 mils**. If you want more options, follow instructions for **Category A** on an EPA chemical resistant category selection chart.

Applicators and handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- **Chemical resistant gloves** for all mixers and loaders and applicators using hand-held equipment





ALLIGARE

ROTARY 2 SL

Some materials that are resistant to this product **are made of any waterproof material**. If you want more options, follow instructions for **Category A** on an EPA chemical resistant category selection chart.

Mixers, loaders, applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- **Chemical resistant gloves** for all mixers and loaders and applicators using hand-held equipment





ALLIGARE

IMAZAPYR 4 SL

Some materials that are resistant to this product are listed below. If you want more options, follow instructions for **Category A** on an EPA chemical resistant category selection chart.

Mixers, loaders, applicators and other handlers must wear:

- Long-sleeved shirt and long pants
- Shoes plus socks
- **Chemical resistant gloves** for all mixers and loaders and applicators using hand-held equipment





Pesticides -- PPE Language

Some materials that are resistant to this product are listed below. If you want more options, follow instructions for **Category E** on an EPA chemical resistant category selection chart.

Applicators and handlers must wear:

- Long-sleeved shirt and long pants;
Shoes plus socks
- **Chemical resistant gloves (≥ 14 mils)** such as barrier laminate, nitrile rubber, neoprene rubber, or viton





AgrisOLUTIONS™

2,4-D LV6

Pesticides -- PPE Language

Some materials that are resistant to this product are **neoprene, nitrile rubber, barrier laminate, or viton**. If you want more options, follow instructions for **Category E** on an EPA chemical resistant category selection chart.

All mixers, loaders, applicators and other handlers must wear:

- Long-sleeved shirt and long pants; Shoes plus socks
- **Chemical resistant gloves** when applying with any hand-held equipment or nozzle, mixing or loading, cleaning, . . .



Chemical resistant apron when applying with hand-held equipment, mixing or loading, cleaning,



Pesticides -- PPE Language



Some materials that are resistant to this product are listed below. If you want more options, follow instructions for **Category E** on an EPA chemical resistant category selection chart.

Applicators and handlers must wear:

- Long-sleeved shirt and long pants; Shoes plus socks
- **Chemical resistant gloves** (?????????)



Chemical resistant apron when applying with hand-held equipment, mixing or loading,



Applicators and handlers must wear:

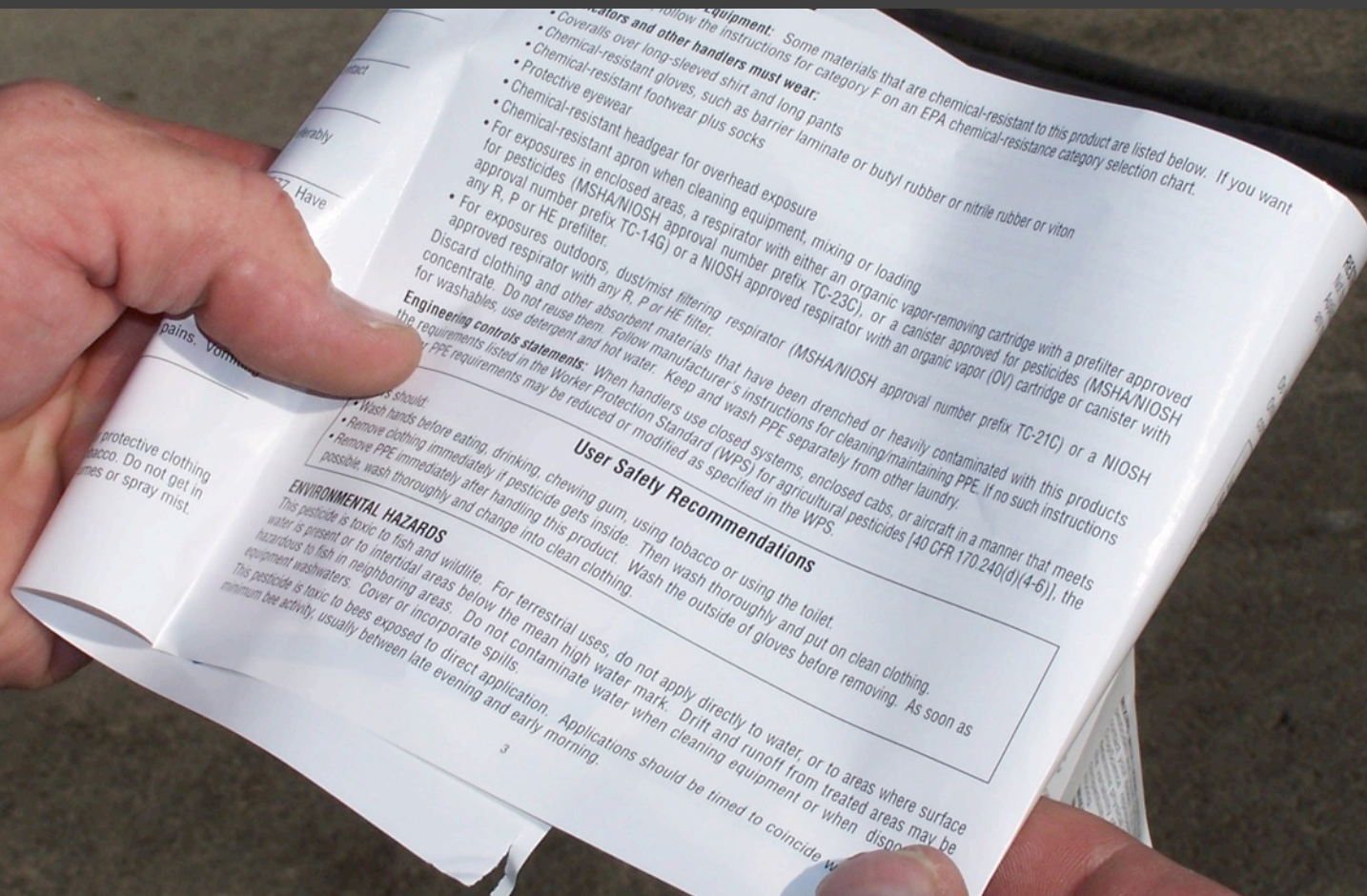
- Long-sleeved shirt and long pants
- Shoes plus socks
- **Chemical-resistant gloves** made of any waterproof materials



Close, but no
cigar!

Should read
“Wear
waterproof
gloves”

Gloves in particular provide best protection. Practice good hygiene. Read the Label Carefully for Appropriate PPE!



Consider Your Health Implications – Basic PPE is Fundamental



Hazard vs Risk



“toxicity”

Hazard

CAN it cause harm?

Inherent, immutable



Hazard

CAN it cause harm?
Inherent, immutable

“toxicity”

Risk

WILL it cause harm?
Depends on exposure

an estimate of
how likely it is
that a substance
WILL cause harm



Risk = Hazard x Exposure

Risk

WILL it cause harm?

**Depends on
exposure**

Hazard

CAN it cause harm?

Inherent, immutable

unlike hazard,
risk is mutable; we can manage it



HEALTH RISK = TOXICITY X EXPOSURE

Toxicity vs Exposure

**The least toxic pesticide may not
be the safest pesticide**



HEALTH RISK = TOXICITY X EXPOSURE

Acute Toxicity = Signal Word

Signal Word = Acute Poisoning

Signal Word \neq Other Health Effects



Exposure Types:

- Acute vs Chronic exposure
- Skin, eyes, mouth, and lungs

Toxicity = Poisoning. **NOT** correlated with long term health concerns

Dose: Amount entering the body over time

Health Effects:

- Allergic & hypersensitive
- Acute vs chronic/long-term



Health Effects

Short Term

- Acute
- Allergic
- Hypersensitive

Long term/Chronic

- Cancer
- Reproductive
- Mutagenicity
- Neurological
- Hormone Disruption
- Others



Toxicity: Set when selecting a pesticide

Exposure:

Reduced by PPE,
safety practices,
application method



Dose: Addressed by
decontamination, first aid, and
medical treatment



Secondary Exposure to Residues

To *'Clean-to-Clean'* and *'Dirty-to Dirty'*

- Containers
- Application equipment
- Clothing, gloves, other PPE
- Treated plants
- Other surfaces
- Spills





HEALTH RISK = TOXICITY X EXPOSURE

**Pesticide Applicators
Need To Focus On
Toxicity
and
*Exposure***



HEALTH RISK = TOXICITY X EXPOSURE

**Pesticide Applicators
Have More Control Over
Exposure than *Toxicity***



HEALTH RISK = TOXICITY X EXPOSURE

Focus on
preventing **large doses**
and
reducing **chronic exposure**
and **secondary exposure**
to pesticide residues.



HEALTH RISK = TOXICITY X EXPOSURE

Treat all pesticides with the same level of care as the most toxic ones.

A universal precaution for ALL pesticides, including organic and 'natural' pesticides.



Personal Protective Equipment (PPE)



PPE – *Last Line of Defense*



Consider the Risks!

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