Herbicides and Eye Protection

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University of Florida
Outline for today’s discussion

• Why eye protection is important
• Eye anatomy and common injuries
• Signal words and labels
  – Herbicides, adjuvants
  – Sunscreens and insect repellents
• Steps for decontamination and cleanup
• Eye Protection options
Why talk about eye protection?

• More than 2.5 million eye injuries occur each year in the United States.

- 6 month study: 3,184 cases of eye injury
- The work place accounted for 48% of all injuries
- Males (Teens and Twenties) accounted for the majority
- 95% minor, 5% major injury
- $5,000,000 direct cost
- Loss of 60 work years
Common routes of exposure to herbicides

• Dermal – Skin
  – Hands
  – Arms
  – Face & Head
  – Eyes
• Oral – mouth & gasterointestinal tract
• Inhalation – nose & lungs
• For humans – dermal is the most significant route of exposure

Source: Pesticide Applicator Training Course, USDA Forest Service Region 8
Anatomy of the Eye

- Anterior chamber (region between the cornea and iris)
- Iris
- Lens
- Pupil
- Posterior chamber (region behind the iris)
- Ciliary body and ciliary muscle
- Conjectiva
- Retina
- Optic Nerve
- Macula
- Retinal blood vessels
- Vitreous body

Cornea
Trigger warning

Graphic images up next…
Foreign body
Hyphema (bleeding in the anterior chamber) commonly results from blunt trauma to the globe
Chemical burn
Cataracts

http://www.webmd.com/eye-health/ss/slideshow-eye-conditions-overview
Allergies
Pesticide Labels

What do label “Signal words” mean?

• Indication of relative **acute toxicity** of the product to humans and animals
  – Acute toxicity: injury or illness produced from a single exposure

• Danger-Poison-

• Danger

• Warning

• Caution
<table>
<thead>
<tr>
<th>Signal Words</th>
<th>Eye Effects</th>
<th>What it means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Danger</td>
<td>Corrosive corneal opacity not reversible</td>
<td>Corrosive-permanent or severe eye damage</td>
</tr>
<tr>
<td>Warning</td>
<td>Corneal opacity: reversible within 7 days; irritation persisting for 7 days</td>
<td>Moderate eye damage</td>
</tr>
<tr>
<td>Caution</td>
<td>No corneal opacity: no irritation, or reversible within 7 days</td>
<td>None to mild eye irritation</td>
</tr>
</tbody>
</table>
What is corneal opacity?
Chemical burn from Paraquat

What are the signal words of commonly used aquatic herbicides?
<table>
<thead>
<tr>
<th>Active</th>
<th>Product</th>
<th>Signal word</th>
<th>Eye irritation/injury</th>
<th>Eye protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyphosate</td>
<td>Rodeo</td>
<td>Caution</td>
<td>Not stated</td>
<td>No</td>
</tr>
<tr>
<td>Diquat</td>
<td>Reward</td>
<td>Caution</td>
<td>Moderate</td>
<td>Yes</td>
</tr>
<tr>
<td>Carfentrazone</td>
<td>Stingray</td>
<td>Caution</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>Flumioxazin</td>
<td>Clipper</td>
<td>Caution</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>Fluridone</td>
<td>Sonar A.S</td>
<td>Caution</td>
<td>Not stated</td>
<td>No PPE listed</td>
</tr>
<tr>
<td></td>
<td>SonarOne</td>
<td>Caution</td>
<td>Moderate</td>
<td>Yes</td>
</tr>
<tr>
<td>Imazamox</td>
<td>Clearcast</td>
<td>Caution</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>Penoxsulam</td>
<td>Galleon</td>
<td>Caution</td>
<td>Not stated</td>
<td>No</td>
</tr>
<tr>
<td>Copper</td>
<td>K-Tea</td>
<td>Caution</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>Imazapyr</td>
<td>Habitat</td>
<td>Caution</td>
<td>Not stated</td>
<td>No</td>
</tr>
<tr>
<td>Topramezone</td>
<td>Oasis</td>
<td>Caution</td>
<td>Moderate</td>
<td>Yes</td>
</tr>
<tr>
<td>Bispyribac</td>
<td>Tradewind</td>
<td>Caution</td>
<td>Moderate</td>
<td>No</td>
</tr>
<tr>
<td>Active</td>
<td>Product</td>
<td>Signal word</td>
<td>Eye irritation/injury</td>
<td>Eye protection</td>
</tr>
<tr>
<td>------------</td>
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<td>-------------</td>
<td>---------------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Sethoxydim</td>
<td>TIGR</td>
<td>Warning</td>
<td>Substantial but temporary</td>
<td>Yes</td>
</tr>
<tr>
<td>2,4-D amine</td>
<td>Weedar 64</td>
<td>Danger</td>
<td>Irreversible</td>
<td>Yes</td>
</tr>
<tr>
<td>Endothall</td>
<td>Hydrothol Granular</td>
<td>Danger</td>
<td>Irreversible</td>
<td>Yes</td>
</tr>
<tr>
<td>Endothall</td>
<td>Aquathol Super K</td>
<td>Danger</td>
<td>Irreversible</td>
<td>Yes</td>
</tr>
<tr>
<td>Fluridone</td>
<td>Sonar Genesis</td>
<td>Danger</td>
<td>Irreversible</td>
<td>Yes</td>
</tr>
<tr>
<td>Triclopyr</td>
<td>Renovate Trycera</td>
<td>Danger</td>
<td>Irreversible</td>
<td>Yes</td>
</tr>
</tbody>
</table>
What about additives?

<table>
<thead>
<tr>
<th>Signal Word</th>
<th>Caution</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSO</td>
<td></td>
</tr>
<tr>
<td>NIS</td>
<td></td>
</tr>
<tr>
<td>Silicone based</td>
<td>Caution, Warning</td>
</tr>
<tr>
<td>Crop oils and concentrates</td>
<td>Caution</td>
</tr>
<tr>
<td>Vegetable oil concentrates</td>
<td>Caution</td>
</tr>
<tr>
<td>Drift control agents</td>
<td>Caution</td>
</tr>
<tr>
<td>Defoamers</td>
<td>Caution</td>
</tr>
<tr>
<td>Compatibility agents</td>
<td>Warning</td>
</tr>
<tr>
<td>Buffering agents</td>
<td>Warning, DANGER</td>
</tr>
</tbody>
</table>
What about insect repellants?

• Not all insect repellents are equal (on the eyes)
• Highest Signal word found: Warning- Causes substantial but temporary eye injury. Harmful if swallowed. Do not get in eyes.
Can waterproof sunscreens cause blindness?

- THIS IS AN URBAN MYTH!
- “While sunscreen is a mild irritant, the most severe eye injury it could cause would be a corneal abrasion, resulting in moderate discomfort during the healing process, but no long-term after-effects.”
  - The American Academy of Ophthalmology 1999
- Zero cases of blindness caused by sunscreen
  - FDA, Poison Control Center
Neutrogena Ultra Sheer® with Helioplex® provides superior broad-spectrum protection against skin-aging UVA and burning UVB rays, and combines it with Dry-Touch technology for a lightweight, clean feel.

Drug Facts

Active ingredients

<table>
<thead>
<tr>
<th>Active ingredients</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avobenzone 3%, Homosalate 15%, Octisalate 5%, Octocrylene 4.5%, Oxybenzone 6%</td>
<td>Sunscreen</td>
</tr>
</tbody>
</table>

Uses
- helps prevent sunburn • if used as directed with other sun protection measures (see Directions), decreases the risk of skin cancer and early skin aging caused by the sun

Warnings
- For external use only • Do not use on damaged or broken skin • When using this product keep out of eyes. Rinse with water to remove • Stop use and ask a doctor if rash occurs • Keep out of reach of children. If swallowed, get medical help or contact a Poison Control Center right away.

Directions
- apply liberally 15 minutes before sun exposure • reapply: • after 80 minutes of swimming or sweating • immediately after towel drying • at least every 2 hours • Sun Protection Measures: Spending time in the sun increases your risk of skin cancer and early skin aging. To decrease this risk, regularly use a sunscreen with a Broad Spectrum SPF value of 15 or higher and other sun protection measures including: • limit time in the sun, especially from 10 a.m.-2 p.m. • wear long-sleeved shirts, pants, hats, and sunglasses • Children under 6 months: Ask a doctor

Other information
- protect this product from excessive heat and direct sun • may stain some fabrics

Inactive ingredients
- acrylates dimethicone copolymer, acrylates/C10-30 alkyl acrylate crosspolymer, acrylates/C12-22 alkyl methacrylate copolymer, beeswax, BHT, butyloctyl salicylate, chlorophenesin, cyclopentasiloxane, diethylhexyl 2,6 - naphthalate, dipotassium glycyrrhizate, disodium EDTA, ethylhexyglycerin, fragrance, glyceryl stearate, methylisothiazolinone, PEG-100 stearate, silica, styrene/acrylates copolymer, triethanolamine, water

Questions or comments?
- Visit www.neutrogena.com or call toll-free 800-299-4786 or 215-273-8756 (collect)

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Ultra Sheer
DRY-TOUCH
SUNSCREEN

Broad Spectrum
SPF 85+

LIGHTWEIGHT,
CLEAN FEEL
fast absorbing
water resistant
(80 minutes)

#1 DERMATOLOGIST
RECOMMENDED SUNCARE

3.0 FL OZ (88mL)
Early signs of a chemical eye burn

- Pain
- Redness
- Irritation
- Tearing
- Inability to keep the eye open
- Sensation of something in the eye
- Swelling of the eyelids
- Blurred vision
If you get herbicide in your eyes...

• DO NOT RUB YOUR EYES!
• Hold eye open and rinse slowly and gently with water for 15-20 minutes
• Remove contact lenses, if present after the first five minutes, then continue rinsing eye
• Call a poison control center or physician for treatment advice
Are you legally required to provide water for eyeflushing?

- Pesticide labels that list eye protection in their PPE statements and pertain to the Worker Protection Standard (WPS) require that at least one gallon of emergency eyeflush water be immediately accessible for each worker and 3 gallons or more for each pesticide handler.
Flush for 15 minutes: How much water do you need?

- 0.1 GPM = 1.5 gallons in 15 minutes
- 0.5 GPM = 7.5 gallons in 15 minutes
- 1 GPM = 15 gallons in 15 minutes
What about eyewash solutions?

- Many experts recommend clean water instead.
- Chemicals or drugs in wash water may increase injury.
- Reality: The small amount in most first aid kits or decontamination kits is far less than you will need for a good 15 minute rinse.
- If you use them, replace regularly.
When should you seek medical attention?

• When the label says to go!
  – Many herbicide labels recommend calling a doctor or poison control for advice

• If you don’t know what you were sprayed with-GO!

• If symptoms get worse-GO!
Keeping herbicide out of your eyes
Know the limitations of different eye protection!

• Herbicide labels that require it typically do not provide any more detail than “eye protection required”
  – Goggles
  – Face shields
  – Safety glasses
What is recommended

• Shielded safety glasses
• Goggles
• Full faceshields
Regular safety glasses- no side shields, no wraparound, frontal protection only

http://www.sciencenc.com/event-help/Eye-Protection/eyeprotection.php
Safety glasses with typical side shields

http://www.sciencenc.com/event-help/Eye-Protection/eyeprotection.php
Safety goggles with indirect vents - large square vents on side

http://www.sciencenc.com/event-help/Eye-Protection/eyeprotection.php
Full face shield - curved
Proper fit is important!
Single unit for better fit

Separate components
Eyeglasses and sunglasses are NOT safety glasses
Good Features of Eye Protection

- Meets or exceeds ANSI Z87.1+ Safety Standard
- Polycarbonate lens material
- Scratch Resistant Hard Coating
- Anti-Fog Coating
- Provides 99.9% UV protection
- 180° optically correct viewing area
- Resilient spring hinge temple
- Non-slip gel temple sleeves
- Soft secure gel nose piece
What is ANSI Z87.1-2003?

ANSI - American National Standards Institute

- The ANSI Z87.1 standard sets forth requirements for the design, construction, testing, and use of eye protection devices, including standards for impact and penetration resistance.

- All safety glasses, goggles, and face shields used by employees under OSHA jurisdiction must meet the ANSI Z87.1 standard.
ANSI Z87.1-2010 minimum requirements

• Provide adequate protection against the hazards for which they are designed
• Be reasonably comfortable
• Fit securely, without interfering with movement or vision
• Be capable of being disinfected if necessary, and be easy to clean
• Be durable
• Fit over, or incorporate, prescription eyewear
New product markings
(ANSI Z87.1 2010, 2015 updates)

- **Impact**: “Z87+” indicates high-velocity impact, and “Z87” alone means basic impact
- **Splash and droplet**: D3 for splash and droplet and D4 for dust
- **Fine dust**: D5
- **Welding**: W plus the shade number
- **UV**: U plus the scale number
- …and several more codes…
Anti-Foggers for glasses and goggles: Do they work?
Prescription Eyewear and Protection

• Wearing contact lenses where potential for eye contamination exists is NOT RECOMMENDED
Make eye protection the standard at work and at home

The home accounted for 25% of those 3000+ cases
Clean up and storage

- Wash your eye protection after every use
- Ammonia based cleansers not good for cleaning eye protection
- Strong detergents may also alter protective coatings
- Store after use to prevent scratches
My Final Recommendation on Eye Protection

• **USE IT FOR ALL PESTICIDE APPLICATIONS**

• Establish the habit of going above and beyond the label

• Use eye protection for household chemicals too!
  – Cleaners, solvents, drain openers

• Treat your eyes as if they are the last ones you will ever have
Good reference

• Fishel, F. 2017. Protecting Your Eyes from Pesticide Exposure.
  – http://edis.ifas.ufl.edu/pdffiles/PI/PI20100.pdf
Carol never wore her safety goggles.

Now she doesn’t need them.