Glyphosate: Facts, Hype and Best Practices

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• I was born at OSU, I spent 10 years in college at OSU, I have worked at OSU now for 13 years, I’ll probably die at OSU, which is OK!!
• I have never worked for Bayer, which acquired Monsanto (manufacturer of Roundup) in 2018
• I am a licensed commercial pesticide applicator in the state of Ohio (category 8: Turfgrass)

Let's walk through this together!!!

• It's ok to have questions
• It's ok to have concerns

Risk = Toxicity x Exposure

The Dose makes the poison

“All substances are poisons; there is none which is not a poison. The right dose differentiates a poison from a remedy!”

- 1 cup of coffee = 😞
- 3 cups of coffee = 😞
- 8 Red Bulls = 😞
Glyphosate

- Most widely used herbicide in the world
- Widely used for non-crop, landscape use
- Used on 90% of soy, 70% of corn crop
- Has low mammalian toxicity
  - Why? Herbicide targets an enzyme found only in plants
  - Signal word: caution — acute toxicity, Cat 3
  - LD₅₀ = 5600 mg/kg (rat, oral)
  - 1008 tablets of 500 mg Tylenol = 200 lb person

Glyphosate in the News:

- 2012 (Semmel et al.) Long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize: Retracted, Republished

Glyphosate in the News:

- March 2015 International Agency for Research on Cancer (ARC/WHO) declares glyphosate a probable human carcinogen (based on hazard)
  - Classified glyphosate as a Group 2A carcinogen
  - Consuming red meat, drinking very hot beverages, and cell phone use
Glyphosate in the News:

- August 2018 a jury awards $289M to a school groundskeeper with terminal cancer who used Roundup for 3-4 years (reduced to 78M)

Glyphosate - Risk for Cancer

Can it cause cancer in any amount? Is real-world exposure enough to cause cancer?

YES IARC
NO EPA exposure assessment

Your RISK

Glyphosate CANCER HAZARD
Glyphosate EXPOSURE

NOT LIKELY TO BE A HUMAN CANCER AGENT
At real world exposure levels

Can we use glyphosate safely?

- "Registration is based on evaluation of scientific data and assessment of risks and benefits of a product’s use"
- "Set pesticide tolerances for all pesticides used in food or feed in a manner that will result in residues in or on food or animal food"

Pesticide Registration Under FIFRA, FQPA, FFDCA

- Extensive scientific, legal, and administrative procedure (6-9 years, millions of $)
- Human Health and Environmental Risk Assessment
  - Laboratory Testing/Toxicological Testing
  - Exposure assessment
- Crop/food tolerances established
  - Maximum contaminant levels in food

Tolerance Levels Established for "defects"

WHY???

The FDA set these action levels because it is economically impractical to grow, harvest, or process raw products that are totally free of non-hazardous, naturally occurring, unavoidable defects.
Pesticide Tolerances

- EPA has established tolerances for glyphosate on a wide range of crops, including corn, soybean, oilseeds, grains, and some fruits and vegetables, ranging from 0.1 to 310 ppm.
- The EPA Allowable Daily Intake (ADI) for glyphosate is set at 1,750 µg (1.75 mg) per kg of body weight.

Glyphosate in my beer and wine???

An adult would have to drink more than 140 glasses of wine a day containing the highest glyphosate level measured just to reach the level that California’s Office of Environmental Health Hazard Assessment (OEHHA) has identified as ‘No Significant Risk Level,’” wrote a spokesperson for the Wine Institute in a statement to USA TODAY.

Mitigating Risk from Pesticides during registration process

- Pesticide label written to ensure pesticide is used as safely as possible
- Pesticides come up for review every 15 years

These agencies determined glyphosate is unlikely to cause cancer in humans

- December 2017: US EPA
- May 2016: Joint Food and Agriculture Organizations of the U.N./World Health Organization
- October 2016: Australian Pesticides and Veterinary Medicines Authority
- April 2017: Canadian Pest Management Regulatory Agency
- March 2017: Committee for Risk Assessment of the European Chemicals Agency

Agricultural Health Study

Results: Among 54,291 applicators, 44,952 (82.8%) used glyphosate, including 7,769 incident cancer cases (73.3% of all cases). In unadjusted analysis, glyphosate was not statistically significantly associated with cancer at any site. However, among applicators in the highest exposure quartile, there was an increased risk of acute myeloid leukemia (AML) compared with never users (HR = 2.44, 95% CI 0.35 to 17.0; P = 0.1, though this association was not statistically significant. Results for AML were similar with a longer (9-year lag, 898 cancer cases, 171 (18.2%) P < 0.05) and 40-year exposure lag (2,044 cancer cases, 250 (12.7%) P = 0.05). In this large, prospective cohort study, no association was apparent between glyphosate and any other cancer or nonmyeloid malignancies overall, including NHL, and its subtypes. There was some evidence of increased risk of AML in the highest exposed group that requires confirmation.

https://aghealth.nih.gov/
Does this mean there is no risk to glyphosate or other registered pesticides?

Absolutely not!
YOU MUST:
✓ Read and follow label
✓ Wear the required PPE

Safety is about reducing Risk
• Risk to you
• Risk to others
• Risk to the environment
• Risk to property

Know what you are working with!

Ranger v. Rodeo
Two different glyphosate formulations

Ranger – aquatic sites NOT on label

Environmental Hazards
Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment.

Rodeo – aquatic sites on label

For control of annual and perennial weeds and woody plants in natural and production forests for site preparation in and around aquatic sites and wetlands, also for perennial.
PERSONAL PROTECTIVE EQUIPMENT (PPE) All mixers, loaders, applicators, and other handlers must wear:
- Long-sleeved shirt and long pants
- Protective eyewear (goggles or face shield)
- Shoes plus socks
- Chemical resistant gloves made of any waterproof material

PPE Requirements depend on the task

PERSONAL PROTECTIVE EQUIPMENT (PPE) All applicators and other handlers must wear:
- Long-sleeved shirt and long pants
- Shoes plus socks

Some items may be worse than nothing at all!

Some glyphosate formulations do not require gloves... ...
Wear Gloves, even if not required by Label

Gloves – the first line of defense

The protective value of gloves

- Farmers who used gloves had 70% less 2,4-D detectable in urine
- Farmers who used gloves had 80% less Captan detectable on hands

Inspect PPE and Wear it Correctly

Store PPE Safely

Don’t do dumb things!

USER SAFETY RECOMMENDATIONS
Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet
Be prepared to decontaminate yourself in the field!

- Water
- Soap
- Towels
- Spare clothing
- Eyewash if you use pesticides requiring eye protection

No, hand sanitizer doesn’t work!

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**Safety Tip**

**Pesticide Spill Response The 3 C’s**

1. Control
2. Contain
3. Clean-up

- Wear PPE
- Don’t rinse into drains
- Dispose of waste properly
- Notify supervisor

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**Safety Tip**

**Keep people out during restricted entry interval (REI)**

**NON-AGRICULTURAL USE REQUIREMENTS**

The Requirements in this box apply to uses that are NOT within the scope of the Worker Protection Standard for agricultural pesticides (40 CFR Part 170). The WPS applies when this product is used to produce agricultural plants on farms, forests, nurseries, and greenhouses. Do not enter treated areas without protective clothing until sprays have dried.

Keep people and pets off treated areas until the sprays have dried.

REI for Ag uses will be LONGER!

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**Safety Tip**

**Don’t contaminate yourself when removing PPE**

Removing PPE - there is a correct order

1. Wash gloves
2. Wash PPE, then remove
3. Wash and remove gloves

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**Safety Tip**

Remove work clothes and shower before contact with your family

I sure hope he’s not wearing his yucky pesticide clothes!

And leave the boots outside the door!

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**Safety Tip**

Wash Work Clothes Separately from Family Wash

- Pesticides can transfer to other items in wash
- Don’t wear clothing again until washed

**IT’S ALL FUN AND GAMES UNTIL THE LAUNDRY HAS TO BE DONE**
Discard heavily contaminated clothing

- Don't try to wash
- Can leave residues in washer, dryer
- Not fully removed from clothing

Safety Tip

Know the possible signs of Pesticide Poisoning

- Headache, dizziness
- Nausea, vomiting
- Sweating or chills
- Stomach cramps, diarrhea
- Muscle cramps or aches
- Rashes, swelling, or burns

Safety Tip

If you are a first responder:

- Remove victim from source of exposure
- Call for emergency help, have label
- Read and follow "First Aid" on pesticide label

Always have emergency information handy

- Your nearest emergency medical facility
- National Poison Control 1-800-222-1222
- Chemtrec – 1-800-424-9300
- Technical advice about chemical spills
- Ohio Department of Agriculture Pesticide Regulation 614-728-6987

ALWAYS HAVE THE PESTICIDE CONTAINER OR LABEL AVAILABLE FOR DOCTOR, OR WHEN CALLING EMERGENCY HOTLINES!!

The OSU Pesticide Safety Education Program 614-292-4070 pested.osu.edu