

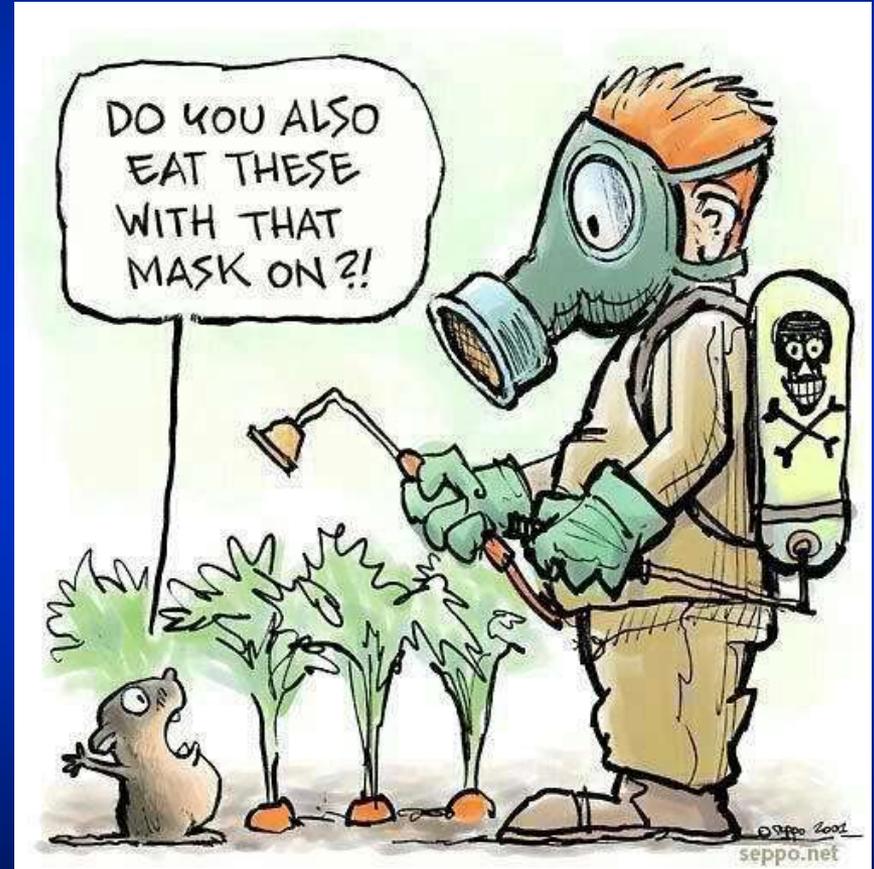
Herbicide Toxicity

Jason Ferrell

University of Florida - IFAS

Pesticides do not have a good reputation

- We've lost the battle for public opinion.
- We must know the impact of our practices



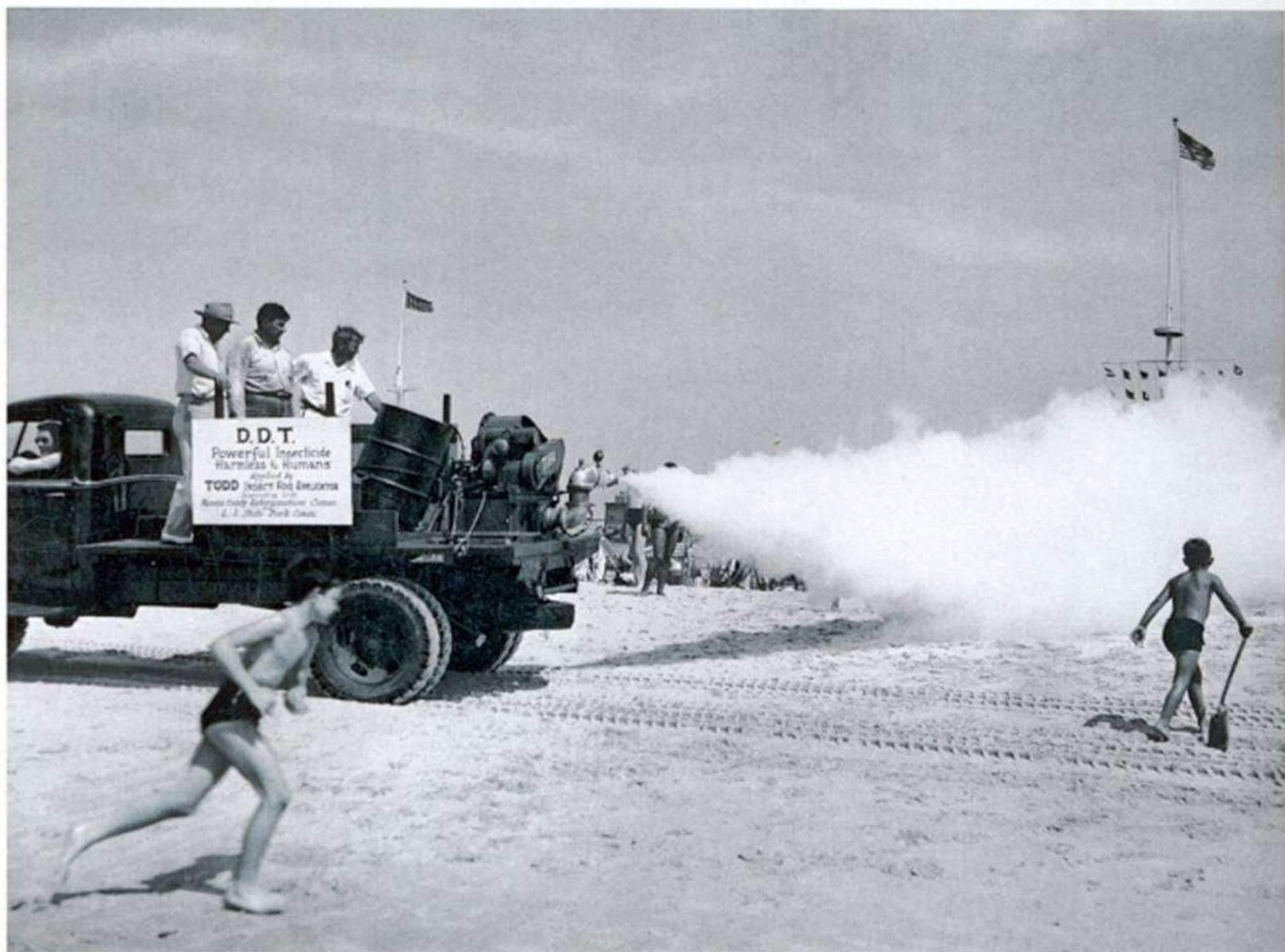
How dangerous are herbicides?

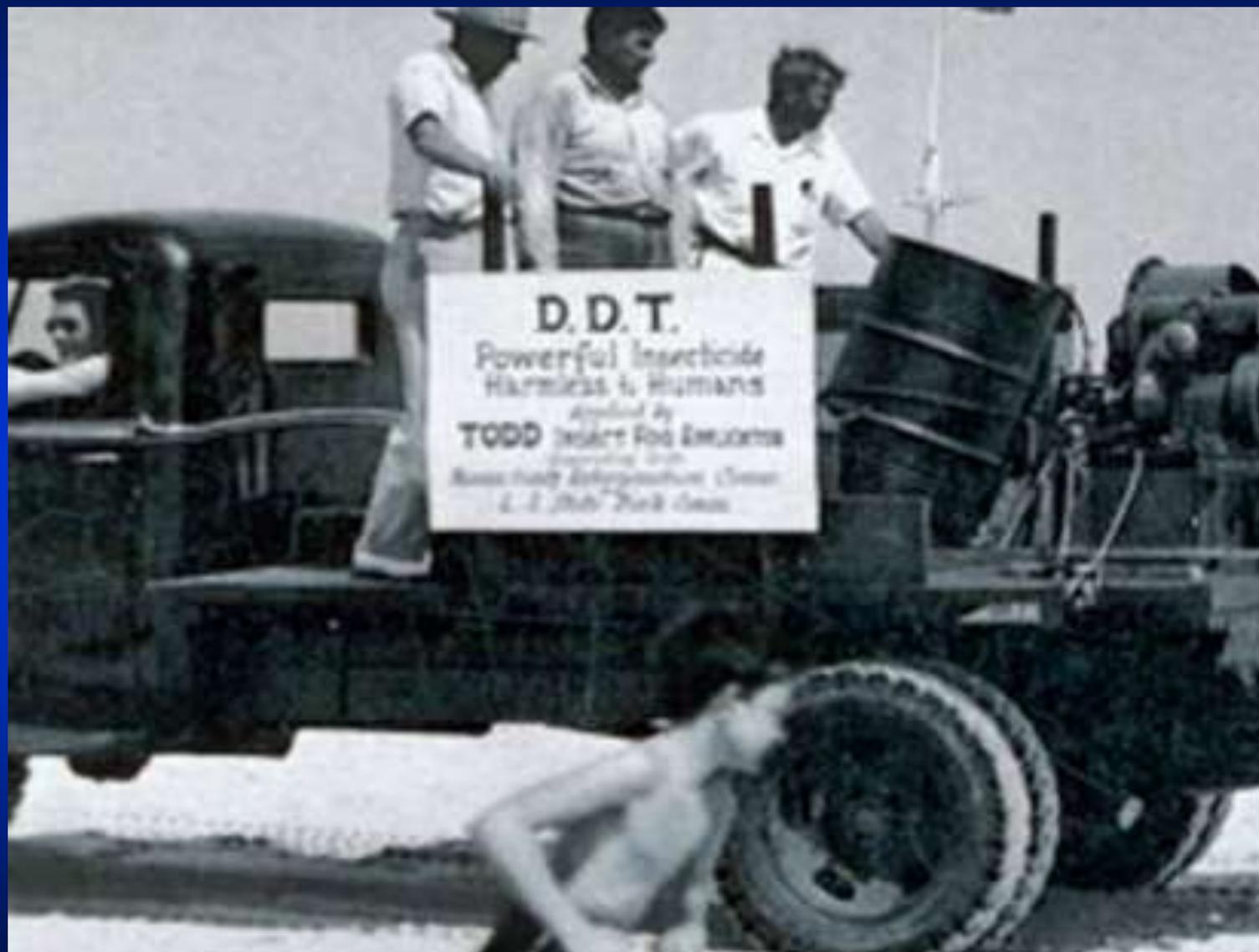
- Are you endangering the environment?
- Are you putting your life at risk when you do your job?
- Are you putting your family at risk?

Discussion

- Why pesticide use is unpopular
- The risk of using herbicides on a daily basis

The dark side of pesticides





DDT

- DDT was non-toxic to humans and a tremendous advancement to human health.
- Was grossly misused!!
- Led to multiple environmental disasters.

Agent Orange



Agent Orange

- A mixture of 2 herbicides.
 - 2,4-D
 - 2,4,5-T
- Synthesis process was poor and dioxin (potent carcinogen) was an unintended byproduct of the synthesis.

Where are we now?

**Adults 20 and Older
(13,723 Exposures)**

Substance	No.
[REDACTED]	2,705
[REDACTED]	1,966
[REDACTED]	1,448
[REDACTED]	1,272
[REDACTED]	1,137
[REDACTED]	1,094
[REDACTED]	695
[REDACTED]	671
[REDACTED]	625
[REDACTED]	616
[REDACTED]	604
[REDACTED]	593

**Adults 20 and Older
(13,723 Exposures)**

Substance	No.
Pain relievers	2,705
[REDACTED]	1,966
[REDACTED]	1,448
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**Adults 20 and Older
(13,723 Exposures)**

Substance	No.
Pain relievers	2,705
Sedatives/hypnotics	1,966
[REDACTED]	1,448
[REDACTED]	1,272
[REDACTED]	1,137
[REDACTED]	1,094
[REDACTED]	695
[REDACTED]	671
[REDACTED]	625
[REDACTED]	616
[REDACTED]	604
[REDACTED]	593

**Adults 20 and Older
(13,723 Exposures)**

Substance	No.
Pain relievers	2,705
Sedatives/hypnotics	1,966
Cleaning substances	1,448
	1,272
	1,137
	1,094
	695
	671
	625
	616
	604
	593

**Adults 20 and Older
(13,723 Exposures)**

Substance	No.
Pain relievers	2,705
Sedatives/hypnotics	1,966
Cleaning substances	1,448
Cardiovascular drugs	1,272
Antidepressants	1,137
Alcohols	1,094
Food products/poisoning	695
Pesticides	671
Cosmetics/personal care products	625
Antihistamines	616
Stimulants and street drugs	604
Hormone/hormone agonists	593

A new era

- *Silent Spring* – 1962
 - Explored the issue of pesticide misuse on the environment.
- FIFRA (Federal Insecticide, Fungicide, and Rodenticide Act) 1972
 - Placed pesticides under authority of EPA.
 - Charged with protecting env. and pub. health.
 - Required registration and labeling.
 - Gave rise to a new families of pesticides.

Pesticide registration

- Costs \$200 million
- Must detail whether
 - Pesticide or metabolites pose health risk
 - Oral, dermal, vapor exposure
 - Acute (LD50) and life long toxicity (NOEL)
 - Present in milk and meat
 - Environmental fate
 - And about 50 other tests

Pesticide risk categories



glyphosate, in the form of its potassium salt, equivalent to 540 grams per liter or 4.0 pounds per U.S. gallon of the acid, glyphosate.

This product is protected by U.S. Patent No's. 5,668,085, RE 37,866 and 6,365,551. Other patents pending. No license granted under any non-U.S. patent(s).

2.0 IMPORTANT PHONE NUMBERS

1. FOR PRODUCT INFORMATION OR ASSISTANCE IN USING THIS PRODUCT, CALL TOLL-FREE,

1-800-332-3111.

2. IN CASE OF AN EMERGENCY INVOLVING THIS HERBICIDE PRODUCT, OR FOR MEDICAL ASSISTANCE, CALL COLLECT, DAY OR NIGHT,
(314)-694-4000.

3.0 PRECAUTIONARY STATEMENTS

3.1 Hazards to Humans and Domestic Animals

Keep out of reach of children

CAUTION!

CAUSES MODERATE EYE IRRITATION
HARMFUL IF INHALED

Avoid contact with eyes, skin, or clothing.
Avoid breathing vapor or spray mist.

Ignite[®] HERBICIDE

KEEP OUT OF REACH OF CHILDREN WARNING - AVISO

Keep Out of Reach of Children

DANGER **PELIGRO**

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

Corrosive • Causes Irreversible Eye Damage • Harmful If Swallowed

KEEP OUT OF REACH OF CHILDREN.

DANGER/  **POISON**
PELIGRO

How Do Herbicides Work?

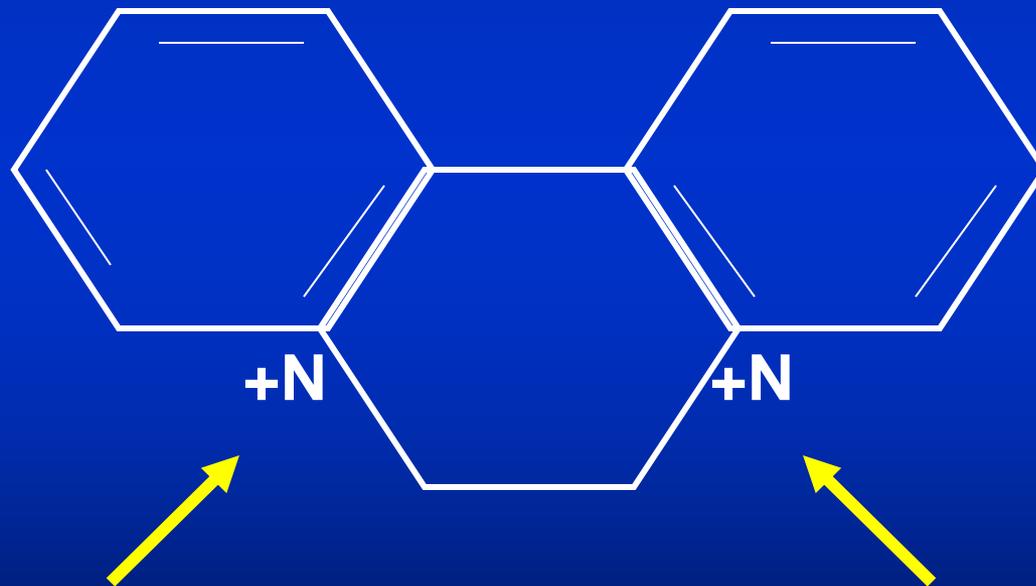
Why do herbicides work?

- They inhibit a process in the plant that is essential to life.

Plant processes inhibited by herbicides

1. photosynthesis
2. amino acids and proteins
3. fatty acid synthesis
4. growth inhibition
5. cell membranes
6. pigment synthesis
7. growth regulation

Diquat (Reward)



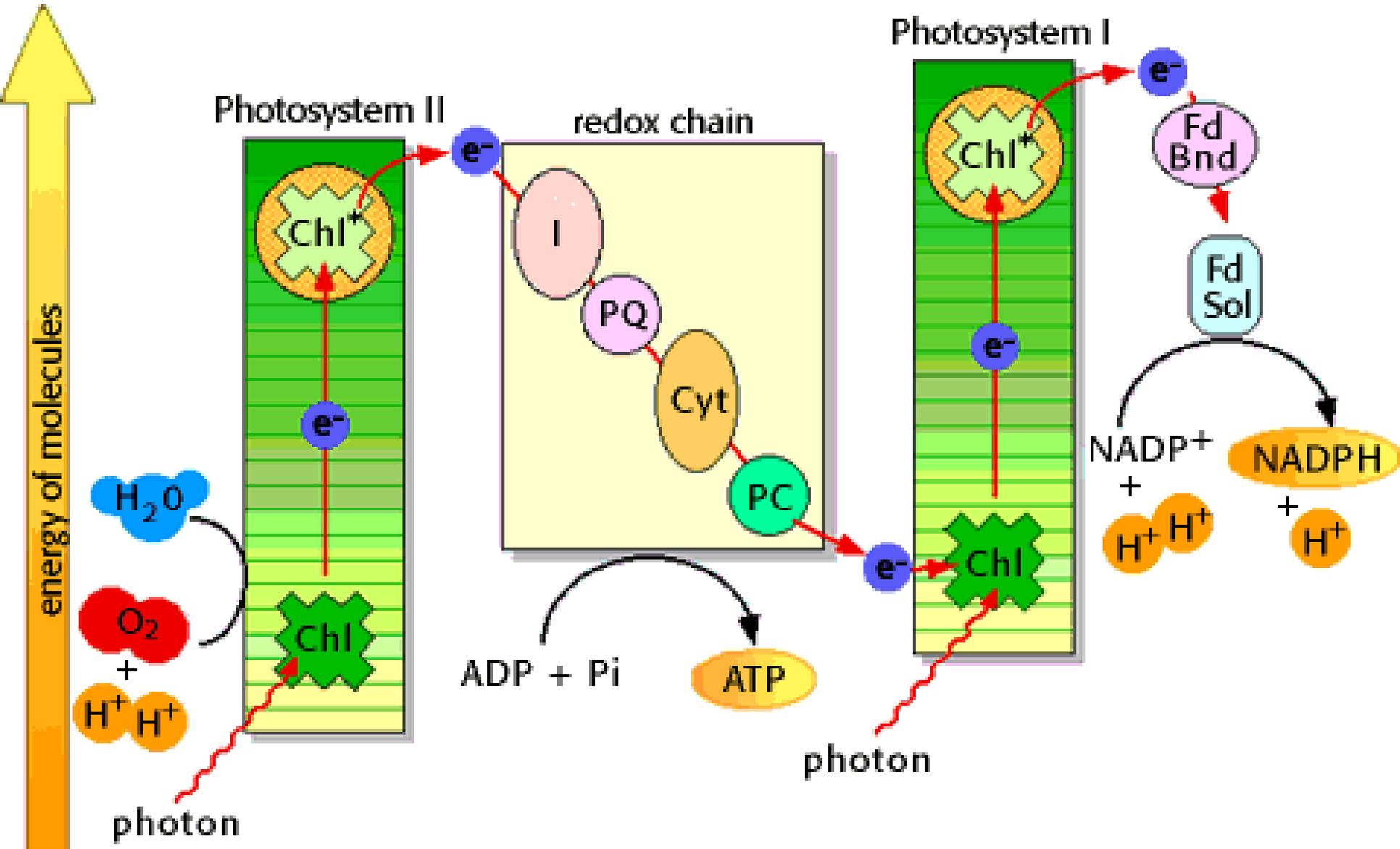
Diquat

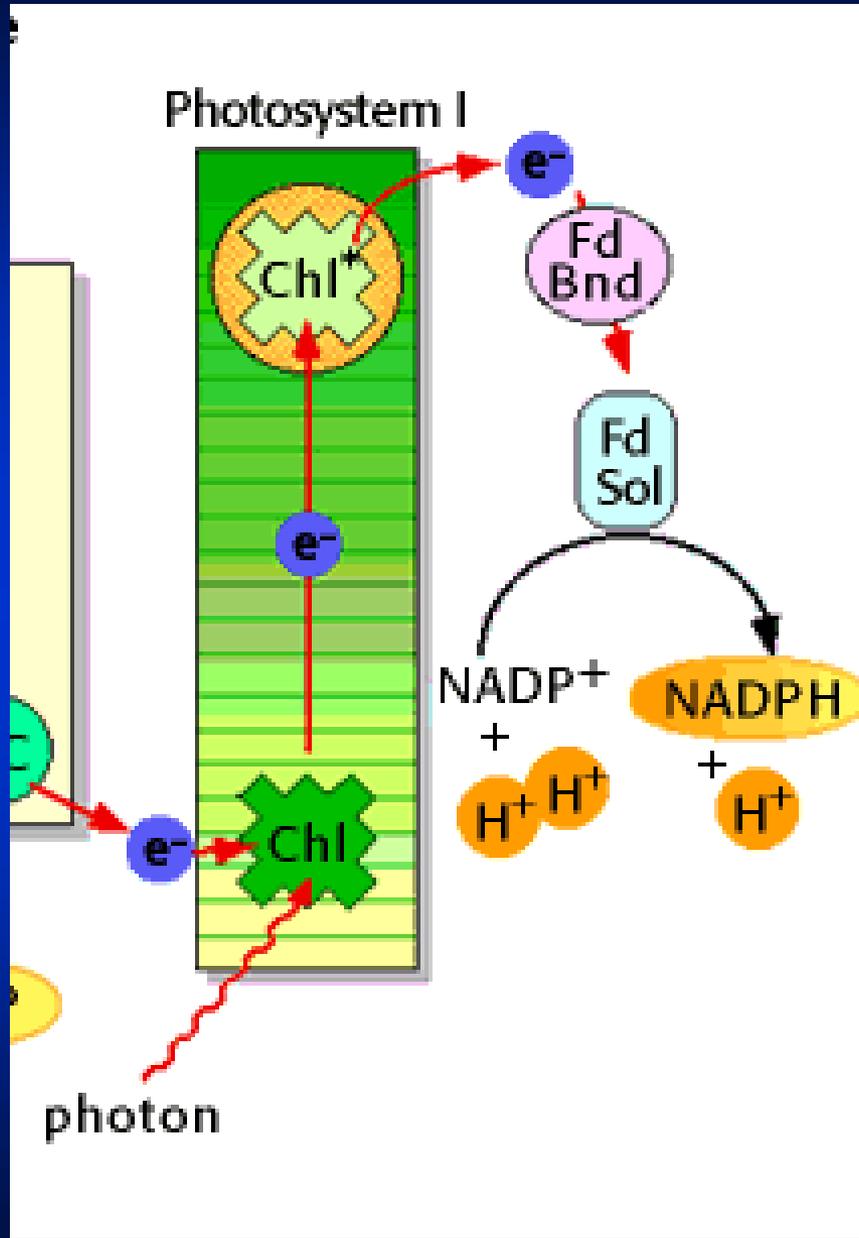
- Mode of action: Photosynthesis
- Activity: leaf only (no soil activity)
- Translocation: None (good coverage is essential)
- Herbicidal effect: Rapid

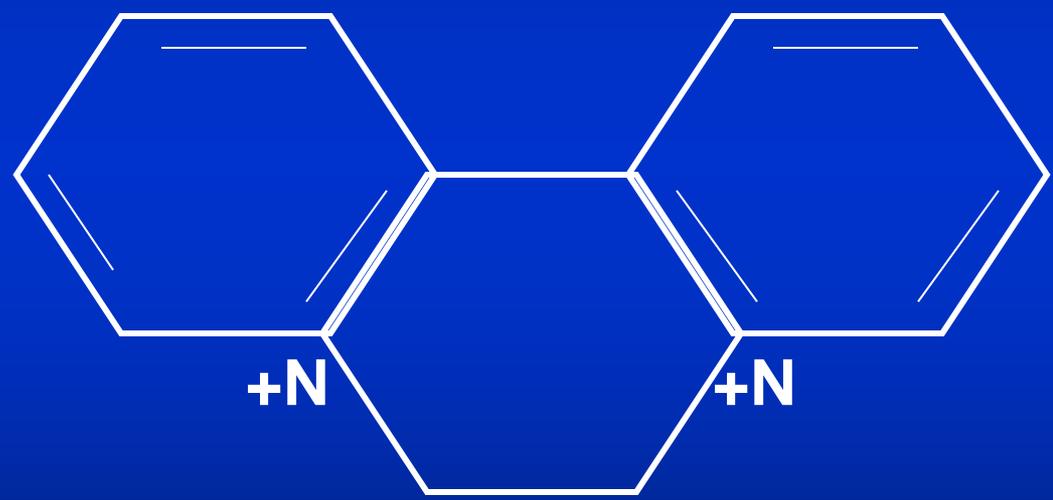
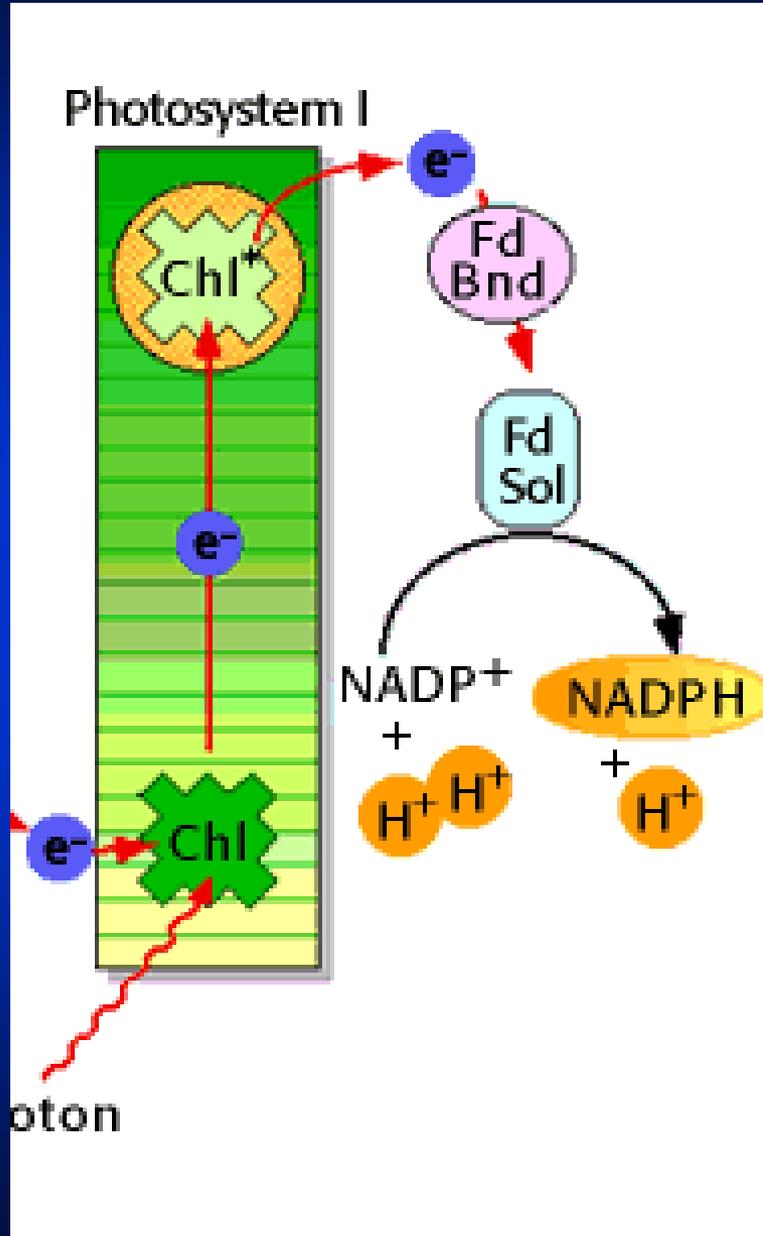
1. Photosynthesis

- process where the plant uses light energy to convert CO_2 and H_2O to sugars, release O_2
- Light reactions
 - chlorophyll absorbs light
 - passes energy down a biochemical chain
 - form intermediates to drive sugar formation

Z-scheme







Paraquat



Good coverage is essential!

Will diquat kill the applicator?

- It is possible,
 - It will steal electrons in the human body
 - It can cause membrane rupturing
- But not highly probable
 - Generally, diquat is excreted in urine within 48 hours of dose
- Wearing the proper PPE is important

How long will diquat persist in the environment?

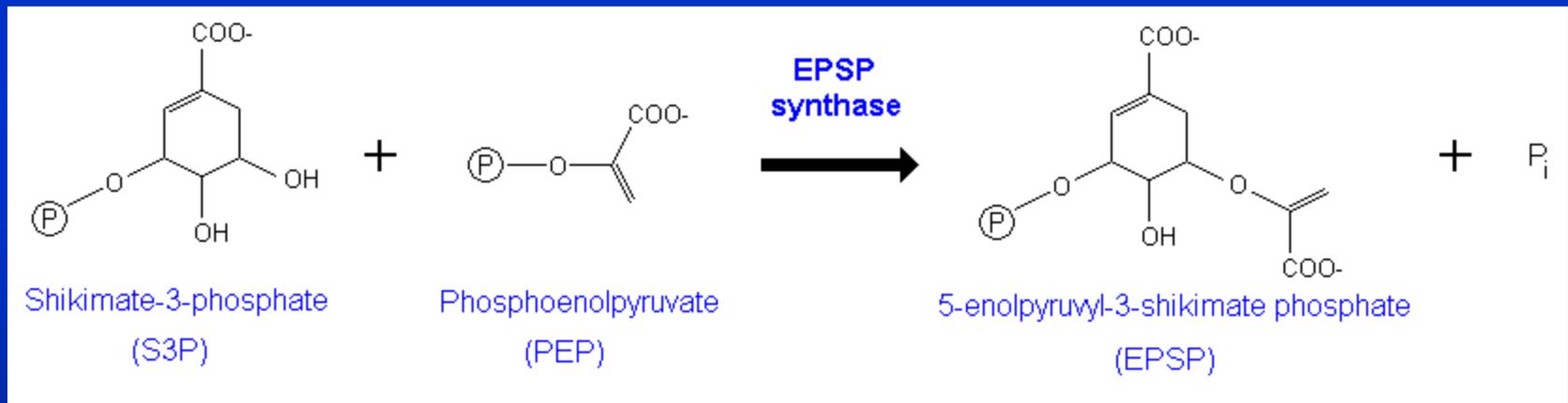
- Soil:
 - binds to soil immediately
- Water:
 - Quickly binds to suspended particles
 - Rest is broken down within 48 hours

Amino acids inhibitors

- essential building blocks for plant growth and function
- unlike animals, plants make their own
- Herbicide examples: glyphosate, imazapyr (Arsenal),

How do they work?

- Block a specific enzyme



How do they work?

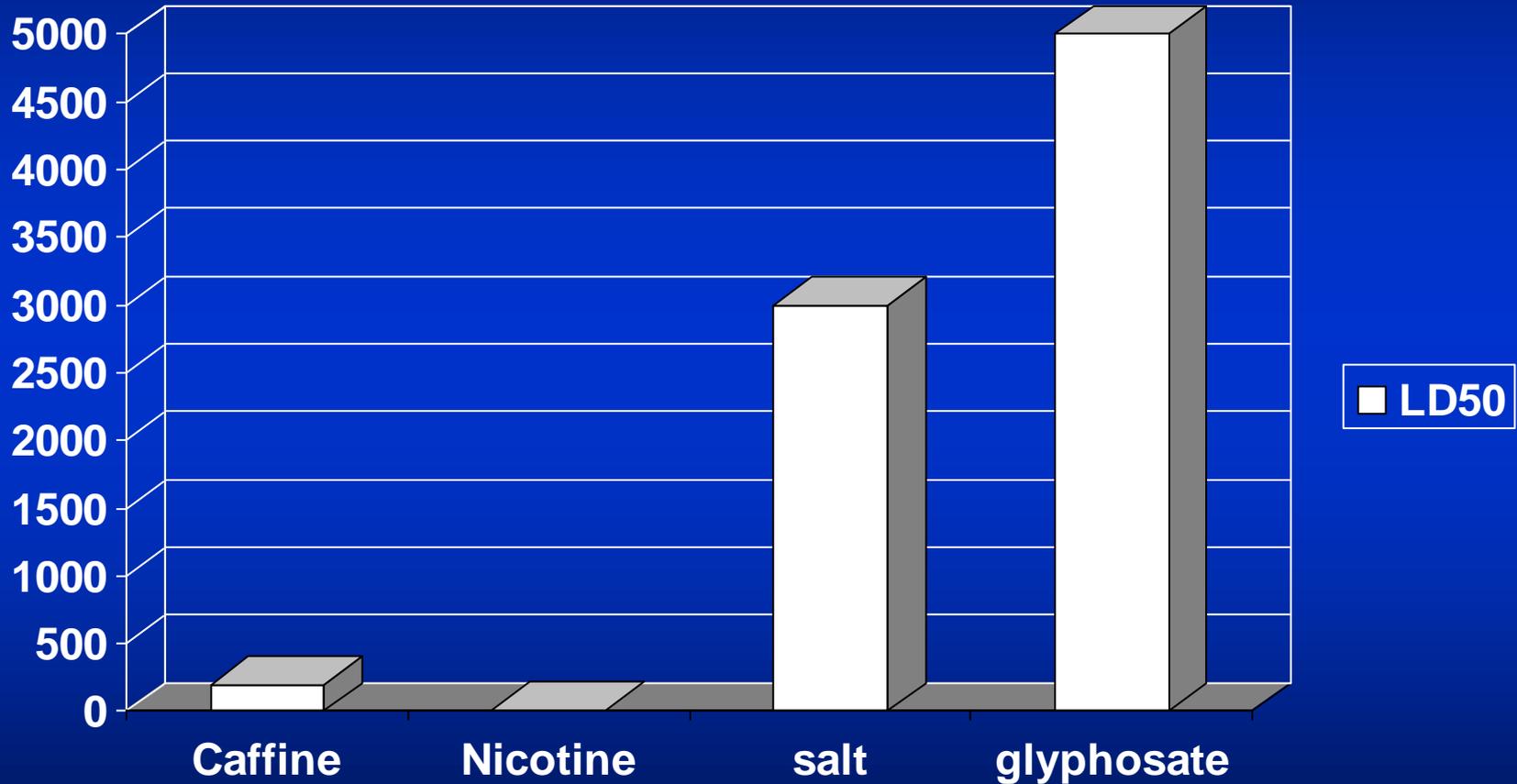
- When you block these enzymes, nothing can get through to the next step.



Glyphosate

- All plants have EPSP enzymes
- Humans do not
- The herbicide has nowhere to bind
- It flushes out in urine

Glyphosate toxicity



*The smaller the number, the greater the toxicity

How important is it to follow
the rules when making an
application?

Detection of Urinary Glyphosate

of Detections

	Applicator	Spouse	Children
Day of application	29	2	9
1 day after	23	0	7
2 days after	16	1	5
3 days after	13	1	4

*Total of 48 farmers and their families

Only one herbicide listed as 'Poison'

PULL HERE TO OPEN ►

RESTRICTED USE PESTICIDE

DUE TO ACUTE TOXICITY

FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S CERTIFICATION.



Herbicide

A Weed, Grass, and Harvest Aid Desiccant/Defoliant Herbicide

Active Ingredient:

Paraquat dichloride (1,1'-dimethyl-4,4'-bipyridinium dichloride)	30.1%
Other Ingredients:	69.9%
Total:	100.0%

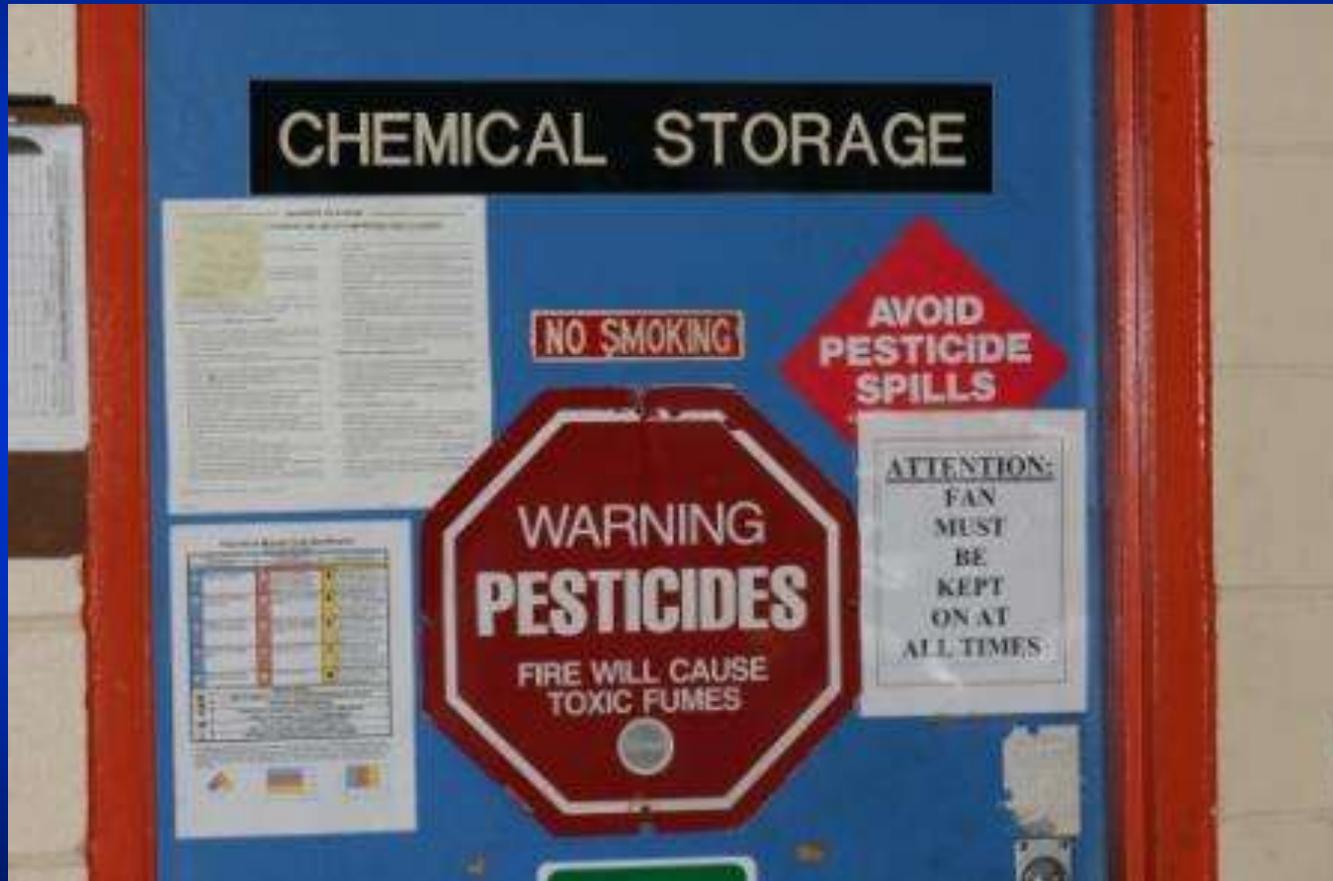
Contains 2.0 pounds paraquat cation per gallon as 2.762 pounds salt per gallon. Contains alerting agent (odor), emetic, dye and Inteon Technology.

KEEP OUT OF REACH OF CHILDREN.

DANGER/
PELIGRO  **POISON**

- NEVER PUT INTO FOOD, DRINK OR OTHER CONTAINERS.
- IF SWALLOWED, TAKE IMMEDIATE ACTION AS PRESCRIBED IN FIRST AID STATEMENT. SYMPTOMS ARE PROLONGED AND PAINFUL.
- DO NOT USE OR STORE IN OR AROUND THE HOME.
- DO NOT REMOVE CONTENTS EXCEPT FOR IMMEDIATE USE.
- THE ODOR OF THIS PRODUCT IS FROM THE ALERTING AGENT WHICH HAS BEEN ADDED, NOT FROM PARAQUAT.

Regardless of pesticide risk –
storage is the same for all



Questions

- Would you ever store herbicides, even those with Caution labels, within reach of children?
- Would you ever allow pesticides near where you prepare food?



SAFE FOR MOST COLOR-FAST WASHABLES This bleach brightens and sanitizes colored washables. To check if a garment is bleach-safe, try this **BLEACH-SAFE TEST**: apply one drop of a test solution (1 tablespoon this bleach plus 1/4 cup water) to a hidden part of the fabric. Check all colors including trim. Let stand 1 minute, then blot dry. No color change means the article can be safely bleached.



STORAGE AND DISPOSAL: Store in original container. Do not reuse empty container, reuse original container.

PRECAUTIONARY STATEMENTS

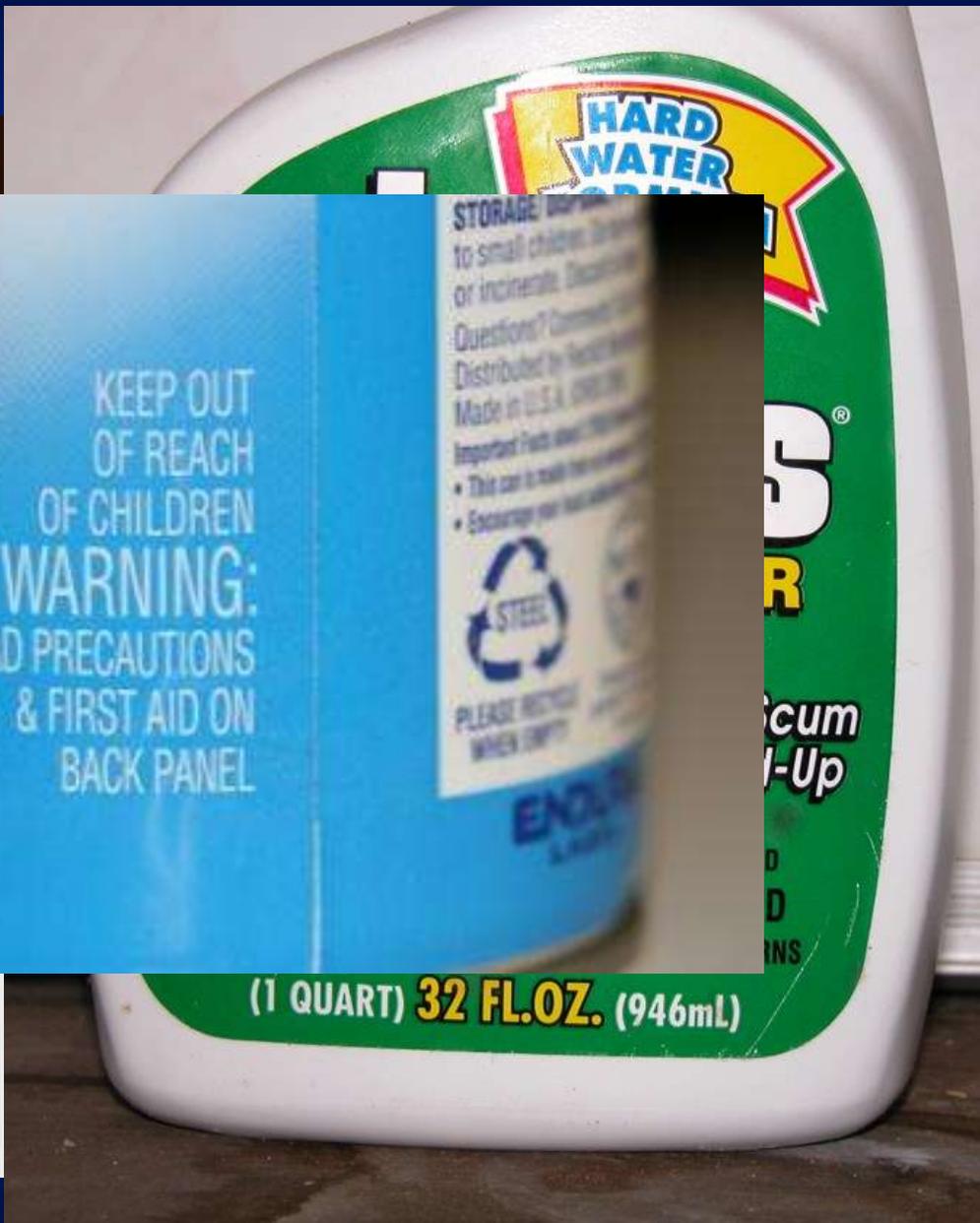
DANGER:

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

Corrosive, may cause severe skin and eye irritations or chemical burns to broken skin. Causes eye damage. Wear safety glasses or goggles and rubber gloves when handling this product. Wash after handling. Avoid breathing vapors.

PRACTICAL TREATMENT:

If in eyes, flush with water for at least 15 minutes. If swallowed, drink at least 15 minutes. If on skin, immediately wash with water. If on clothing, wash thoroughly.



DRANO

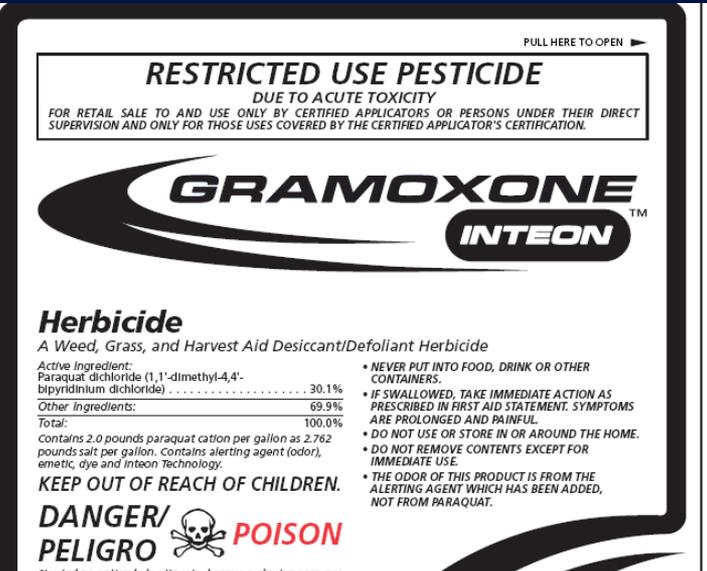
CRYSTAL

CLOG REMOVER

POISON:  KEEP OUT OF
REACH OF CHILDREN. CAUSES SEVERE BURNS
ON CONTACT. READ BACK LABEL CAREFULLY.

NET WT 18 OZ (509g)





- Restricted use
- Must be licensed and trained to purchase
- Stored behind locked door with vent fan



- Anyone can purchase
- Can be stored anywhere

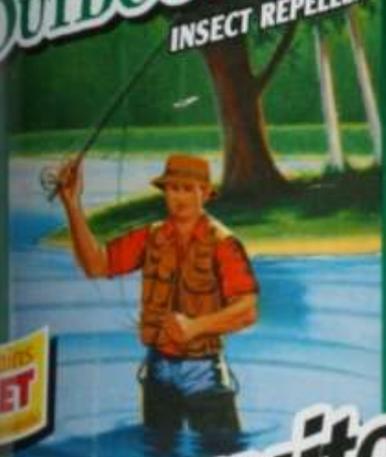


Economy Size!

Unscented

Cutter

OUTDOORSMAN
INSECT REPELLENT



Contains
DEET

Mosquito Repellent

ORTHO®

Español
Ver panel
posterior

ORTHENE®

FIRE ANT KILLER



1 For outdoor
home use only

**DESTROYS THE MOUND
KILLS THE QUEEN • NO WATERING-IN**

Active Ingredient
Acephate.....50%
Other Ingredients.....50%



Repels ^{UP TO} **8** Hrs'

8

Hrs'

REPELS MOSQUITOES
THAT MAY CARRY WEST NILE VIRUS!

Also Repels Ticks, Biting Flies, Gnats,
No-See-Ums, Chiggers & Fleas

KEEP OUT OF REACH OF CHILDREN
WARNING Read precautions on back panel

Net Wt 7.5 oz (212g)

**DESTROYS THE MOUND
KILLS THE QUEEN • NO WATERING-IN**

Active Ingredient
Acephate.....50%
Other Ingredients.....50%

KEEP OUT OF REACH OF CHILDREN
CAUTION See back panel for additional
precautionary statements.



1-800-4-A-ANT

ACE

ACE 13594

ACE PRICE

CAUTION: CONTAINS Isopropyl Alcohol C.A.S. #67-63-0; Toluene C.A.S. #108-88-3; Stoddard Solvent C.A.S. #8052-41-3; Methyl Isobutyl Ketone C.A.S. 108-10-1; 1-1-1 Trichloro Ethane C.A.S. #71-55-6; Butyl Cellosolve C.A.S. #111-76-2.

Vapor harmful. May affect the brain or nervous system causing dizziness, headache or nausea. Causes eye, skin, nose and throat irritation.

NOTICE: Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

Keep away from heat, sparks and open flame. Vapors may cause flash fire. Do not smoke. Extinguish all flames and pilot lights, and turn off stoves heaters, electric motors and other sources of ignition during use and until all vapors are gone. Prevent build-up of vapors by opening all windows and doors to achieve cross-ventilation.

Use only with adequate ventilation. Do not breathe vapors or spray mist. To avoid breathing vapors or spray mist, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches or dizziness, increase fresh air or wear respiratory protection (NIOSH/MSHA TC 23C or equivalent) or leave the area. Close container after each use. Avoid contact with eyes, skin and clothing. Wash thoroughly after

EZPOUR
NO SPLASH DESIGN

Prestone®

Antifreeze/Coolant
Nothing Protects Better

- Against Rust and Corrosion
- Against Temperature Extremes -84° to 276°F

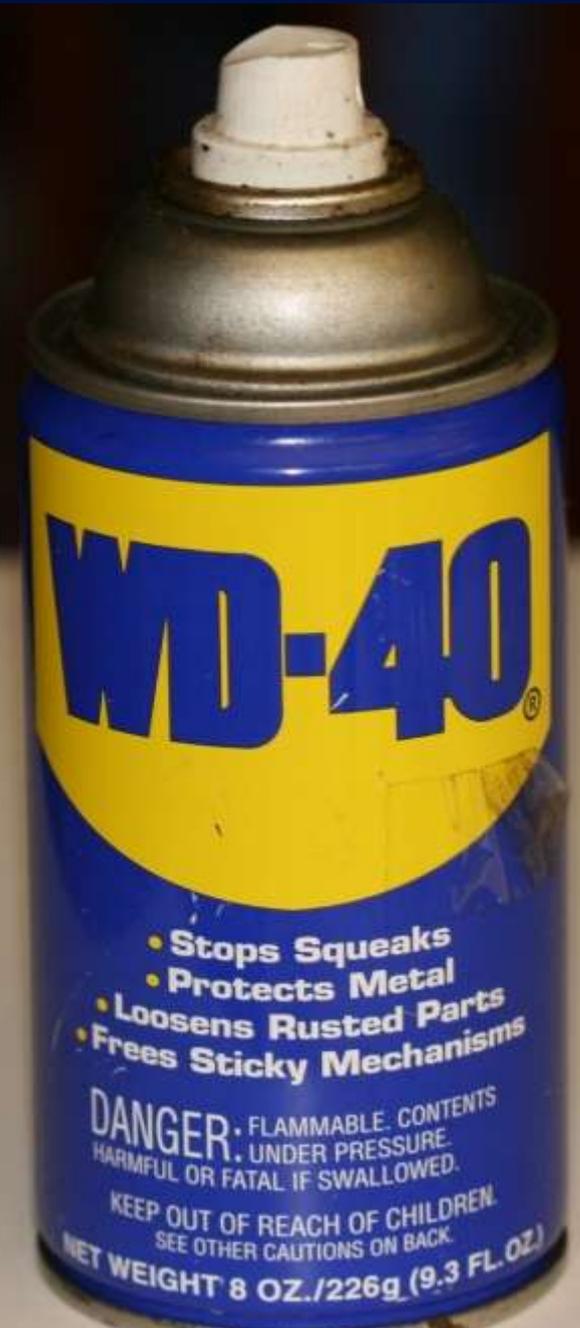


Promotional Partner

OF THE NATIONAL FOOTBALL LEAGUE

1 GAL. (3.78 L)

WARNING: HARMFUL OR FATAL IF SWALLOWED. Read carefully other cautions on back label.



- Stops Squeaks
- Protects Metal
- Loosens Rusted Parts
- Frees Sticky Mechanisms

DANGER • FLAMMABLE. CONTENTS UNDER PRESSURE.
HARMFUL OR FATAL IF SWALLOWED.
KEEP OUT OF REACH OF CHILDREN.
SEE OTHER CAUTIONS ON BACK.
NET WEIGHT 8 OZ./226g (9.3 FL. OZ.)

If irritation persists get medical attention.
Ethylene glycol causes birth defects in laboratory animals. Solution is poisonous to animals.
KEEP OUT OF REACH OF CHILDREN.

Take Home Message

- Today, our pesticides are more environmentally and human health friendly than ever.
- Great effort is expended to ensure their proper use.
- On the other hand, common everyday cleaners are almost unregulated and often pose a greater health risk than pesticides.