Controlling Pesticide Exposures

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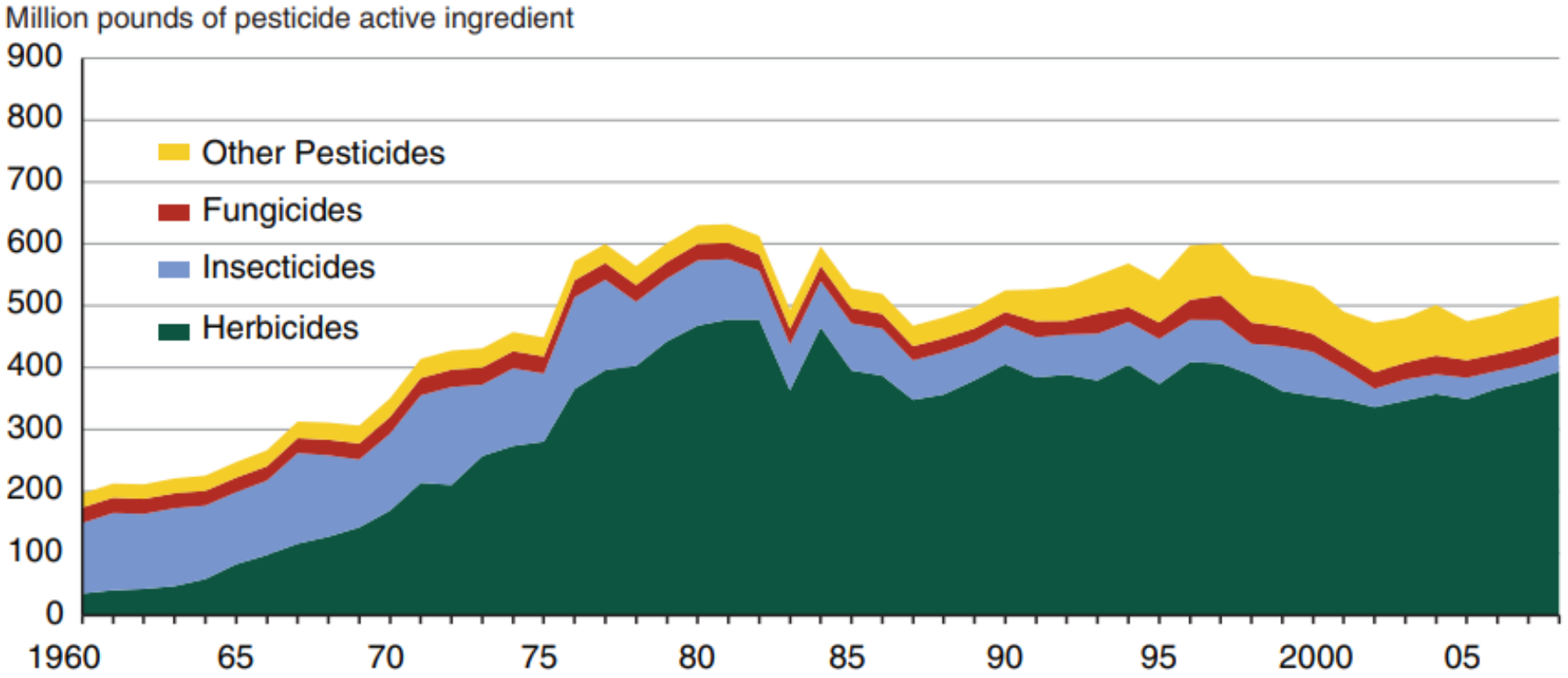
Figure 1

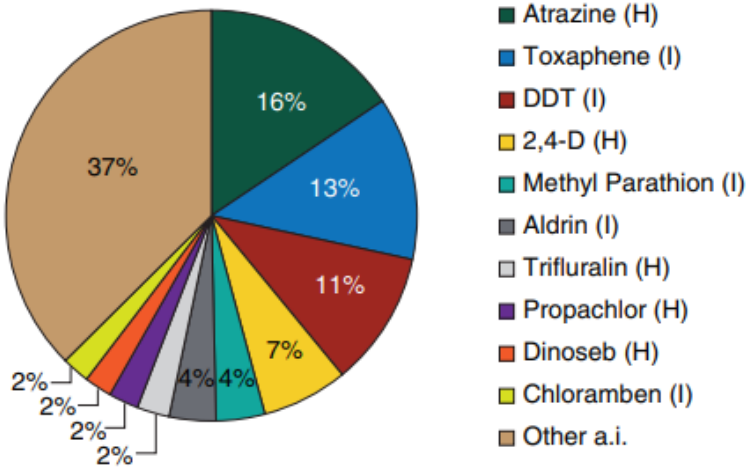
Pesticide use in U.S. agriculture, 21 selected crops, 1960-2008



Source: Economic Research Service with USDA and proprietary data. See Appendix 2.

Figure 9

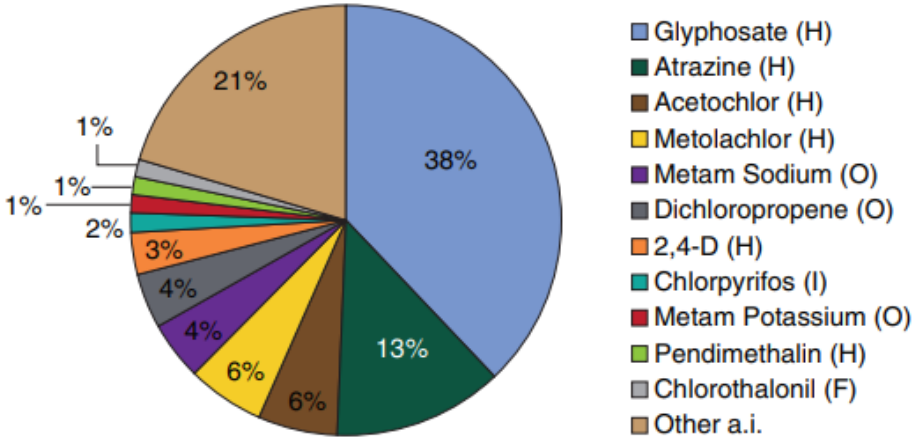
Pesticide use by active ingredient (a.i.), 21 selected crops in 1968, percent total pounds of a.i. applied[1]



[1]This graph shows the top pesticide a.i. (herbicide = H, insecticide = I) used in 1968.
Sources: Economic Research Service with USDA and proprietary data. See Appendix 2.

Figure 10

Pesticide use by active ingredient (a.i.), 21 selected crops in 2008, percent total pounds of a.i. applied[1]



[1]This graph shows the top pesticide a.i. (herbicide = H, insecticide = I, fungicide = F, and other = O) used in 2008.
Sources: Economic Research Service with USDA and proprietary data. See Appendix 2.

Farmers Tend to be Healthier

- Farmers in many countries have lower overall death rates and cancer rates.
- However, compared to the general population certain diseases are higher:
  - Respiratory disease – asthma, COPD
  - Neurological diseases
  - Spontaneous abortions
  - Cancers – leukemia, nonHodgkin's lymphoma, multiple myeloma, soft tissue sarcoma, skin, lip, stomach, brain, and prostate

Some Diseases May Be Related to Pesticide Exposures

- Respiratory disease – paraquat, organophosphates, carbamates, atrazine, alachlor
- Skin disease – irritation, dermatitis, allergic reaction
- Neurological disease – organophosphates and carbamates
- Reproductive concerns – triazine herbicides
- Retinal degeneration – fungicides, organochlorines, organophosphates
- Cancers – herbicides
  - Leukemia
  - Non-Hodgkin's Lymphoma
  - Soft Tissue Sarcoma
  - Prostate

Pesticide Program Elements

- Worker Management Training
- Work Practices
- Personal Protective Equipment
- Facility Design
- Container Management
- Emergency Considerations
- Medical Surveillance
- Environmental Considerations - Drift Management
- Integrated Pest Management-Hazard Reduction

Pesticide Regulation

- Pesticides are regulated in the U.S. by the EPA through the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug, and Cosmetic Act (FFDCA).
- Pesticide products must be registered by the EPA.
- An approved label is required on all pesticide containers.

First: Read the Label

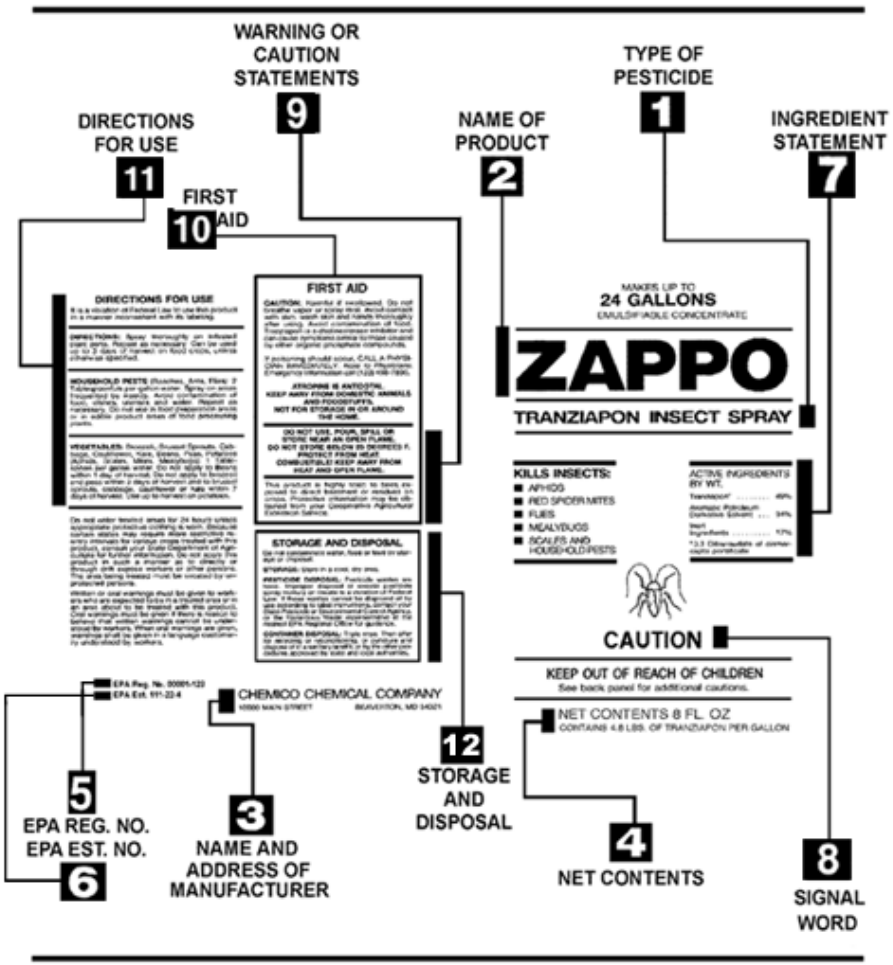


Figure 1. Specimen Label. Pesticide Management Education Program. *Pesticide Applicator Training Manual: CORE Manual, Northeastern Regional Pesticide Coordinators.* 2nd Ed., Cornell University, Ithaca, New York. 2000.

Pesticide Labels

- Type of Pesticide
- Name, Brand, Trademark
- Name and address of manufacturer
- Contents
- Product registration number
- Producer registration number
- Ingredient statement
- Signal of products relative toxicity – Danger, Warning, Caution
- Warning statements
- First aid
- Directions for use
- Storage and Disposal

Restricted-Use Pesticides

- Pesticide products are classified as either restricted-use or general-use.
- Pesticides labeled as restricted-use pesticides must only be applied by persons certified or persons under the supervision of a certified applicator.
- Certification training and examinations are generally administered by the states.

Worker Protection Standard

- The EPA Worker Protection Standard requires:
  - Pesticide safety training
  - Notification of pesticide applications
  - Use of personal protective equipment
  - Restricted entry intervals following application
  - Decontamination supplies
  - Emergency medical assistance

Worker – Management Training

- Many resources are available for pesticide safety training through:
  - USEPA – Office of Pesticide Programs
  - US Dept. of Agriculture Cooperative States Research Extension and Education Services
  - State and Land-Grant Universities

Quality of Training – Level of Training

- Trained, knowledgeable trainers
- Training materials geared to trainees
- Adequate training facility
- Evaluation of knowledge acquired

Safe Work Practices

- Handling, Mixing, Loading, and Applying Pesticides
  - Proper storage
  - Maintaining labels
  - Use of personal protective equipment
  - Proper mixing and loading
  - Good hygienic practices
    - eating, drinking, and smoking
    - decontamination
    - laundering of clothing

After Application Post Warning Signs

Applying Herbicide – Boom Sprayers

Pesticide Mixing

Eye Protection

- Some pesticides may be eye irritants or corrosive
- Safety glasses, goggles, and face shields are recommended when mixing, loading, and applying many pesticides.

College of Public Health

Use of Apron

Hygienic Practices

- Wash hands thoroughly prior to food and beverage consumption and smoking.
- Remove clothing and shower soon after work with pesticides is complete.
- Work clothing should be washed separately from other clothing – it may be difficult to completely decontaminate clothing.

Applying Insecticide to Cattle

Smoking Soon after Loading

Personal Protective Equipment PPE

- Skin is usually the primary route of exposure.
- Hand contact may account for over 90% of the total exposure.
- Need procedures which define required PPE and supervision of use.
- Guidelines from pesticide and PPE manufacturers are available.

General Minimal PPE Guidelines

- Whenever working with pesticides, a long-sleeved shirt and long-legged pants that fully cover the arms and legs, and shoes and socks should be worn.

Personal Protective Equipment Program

- Assess opportunities for exposure
- Assess potential adverse effects and PPE requirements
- Identify alternative controls – engineering
- Select appropriate protective equipment
- Inspect and maintain
- Decontaminate
- Store equipment properly

Selecting PPE

- Consider compatibility with pesticide and chemical.
- Determine Breakthrough Time and Permeation Rate (degradation).
- Evaluate effect on movements, dexterity, vision, and heat stress.
- Do not wear leather or fabric gloves or gloves with absorbent liners.
- Do not put contaminated hands inside gloves or clothing.

Glove Selection

- Rubber, vinyl, or plastic gloves are generally acceptable, but specific glove requirements will be noted on the label.
- Gloves should extend at least to mid-forearm.
- Gloves should be frequently replaced.
- The outside of gloves should be washed before removal.
- Inspect gloves prior to wear and after removal.
- Properly dispose of used gloves.

Protective Gloves

Pesticide Mixing Plant Maintenance

Other Protective Clothing

- Arm and leg guards
- Chaps
- Aprons
- Impermeable suits
- Hoods

Need for Protective Clothing?

Harvesting Roses

Protective Pants, Boots, and Gloves

Protective Clothing

Controlling Heat Stress

- Protective clothing increases heat stress by restricting evaporative cooling and increasing body burden
- Organophosphates and carbamates share similar symptoms with heat stress.
- Preventive measures:
  - Increase rest periods
  - Acclimatize workers
  - Provide fluid replacement
  - Use cooling devices
  - Substitute for lighter protective clothing or engineering controls

Respiratory Protection

- Respiratory protection is required for some pesticides, particularly in enclosed areas.
- Respirators should be used within the context of a comprehensive respiratory protection program—selection, medical evaluation, fit-testing, cleaning, maintenance

Respirators

Facility Design

- Provide closed-systems whenever possible

Enclosed Cab Tractor – Methyl Bromide Fumigant

Pesticide Storage

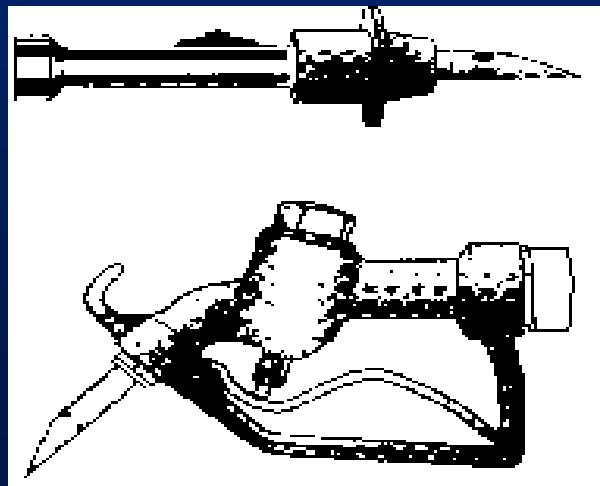
- Store pesticides in their original labeled container.
- Maintain inventory, MSDS, and product labels
- Provide emergency contact list nearby

Storage and Container Management

- Pesticides should be stored away from food and potable water sources.
- Spill containment and absorbent materials should be provided nearby
- Incompatible chemicals should not be stored near each other, acids, alkalis, oxidizers, reactants
- Warning signs and labels should be clearly visible

Empty Containers

- Triple rinse containers immediately; pressure washing reduces rinsate.
- Crush or puncture empty containers and dispose of properly in approved landfill.
- May be able to return containers to supplier.



Emergency and Medical Surveillance

- Prepared to provide decontamination and first aid
  - wash station, eye wash, first aid kit
- Emergency medical contacts
  - EMS
  - Hospital, physician
  - Poison control
- Medical surveillance
  - cholinesterase monitoring
  - general medical condition

Pesticide Drift During High Wind

Crop Dusting

Drift Management

- Large particles settle more quickly and have less propensity to drift—particles <50 µm may stay suspended for long periods of time.
- Nozzle size, orientation, height, and pressure influence drift.
- Weather conditions—wind speed, temperature, and humidity influence drift.
- May employ shielded booms or electrostatic spraying.
- GPS helps provide positioning of spray and eliminate the need for flaggers.

Environmental Considerations

- Nearness to commercial and residential areas
- Nearness of water bodies
- Soil type
- Back-flush valves on water hoses
- Protection of non-crop and wildlife areas—buffer zones

Integrated Pest Management

- Promotes the adoption of safer, less persistent pesticides.
- Use of beneficial predators, parasitoids, pathogens, and manual methods

Integrated Pest Management

- Monitor pest problems and resort to use of pesticides only when pest damage exceeds an economic threshold.
- Develop list of all available pesticides for a specific problem, obtain toxicity information on each pesticide, and evaluate the strengths and weaknesses of each pesticide.
- Develop a plan for minimal use of pesticides when necessary.