

Agricultural Health: Traumatic Injuries and Hazardous Chemical Exposures

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Take Away Points

- Multiple physical and chemical hazards exist on farms for workers and residents
- Regulatory context place farmers at particular risk
- Agriculture health services context increases risk
- There are multiple occupational exposure routes
- Clinicians are vital sources of ag health and safety information

Context of Agriculture and 1.4 Million Family Farms

- Regulatory Status
- Risks for Injury & Illness
- Intersection of Occupational and Private Domains

Farm Families are Medically Underserved

- Rural residents have lower incomes and higher poverty rates
- Rural patients are diagnosed at later disease stages
- Shortage of rural health professionals

New England Dairy Farm



New England Farm Census

■ Number of Farms	<u>1992</u>	<u>2001</u>
■ CT	4000	3900
■ ME	7300	6700
■ MA	6400	6000
■ NH	2700	3100
■ RI	700	700
■ VT	6400	6600
■ NE TOTAL	27,500	27,000
Average farm size (acres)	160	146

Guide to Farm Health Hazards

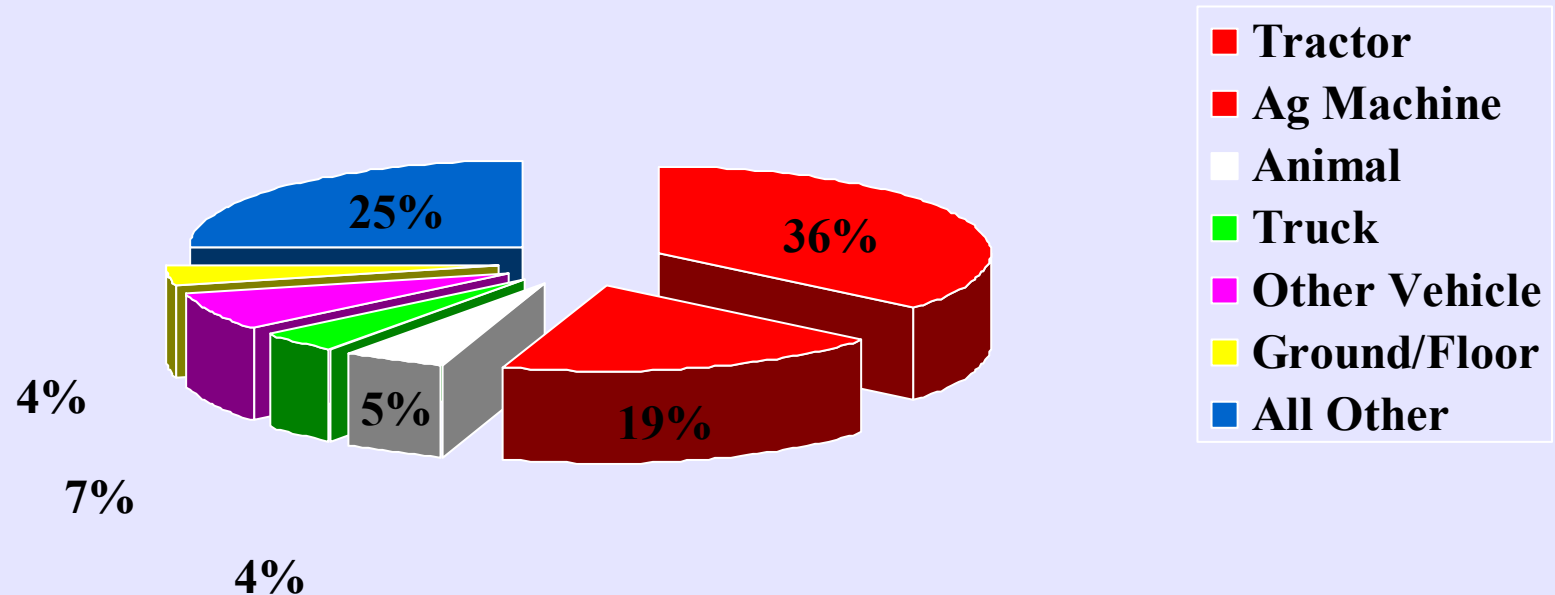
Organ System or Disorder	Principal Exposures	Possible Medical Manifestations
Lungs	Organic dust, microbes, molds, fungi, endotoxins, allergens	Chronic bronchitis, asthma, hypersensitivity pneumonitis, organic-dust toxic syndrome
Neurologic disorders	Pesticides, solvents, fumes	Acute intoxication, peripheral neuritis, Parkinson's disease, ⁺ acute and chronic ⁺ encephalopathy
Accidents	Tractor rollovers, machine, animal and farmyard injuries	Suffocation, crushing, lacerations, amputations, eye injuries
Hearing loss	Motor and animal noise, ototoxic exposures	Hearing impairment, deafness
Skin	Pesticides, fuels, fungi, sun, mites, parasites	Dermatitis, dermatophyte infections, cancer ⁺
Cancer ⁺	Pesticides, fumes, sunlight, diet, unknown	Hodgkin's disease; multiple myeloma; soft-tissue sarcoma; leukemias; cancer of skin, prostate, stomach, pancreas, testicle; glioma

Work Fatality Comparisons - 1998

Industry	Workers	Deaths	Deaths per 100,000 workers	Disabling Injuries
All Industries	134,688,000	5,100	3.8	3,800,000
Agriculture	3,348,000	770	22.5	150,000
Mining/quarrying	562,000	130	23.1	20,000
Construction	8,479,000	1,190	14.0	400,000
Manufacturing	19,993,000	600	3.0	670,000
Transportation/ public utilities	7,948,000	850	10.7	370,000
Trade	27,473,000	450	1.6	710,000
Services	46,766,000	640	1.4	900,000
Government	20,118,000	470	2.3	580,000

Farm Work Fatalities, 1997 - 21 States

Agricultural Work Fatalities By Source of Injury



Lost-time Injuries by Region of US for Field Crop Operations, 1995

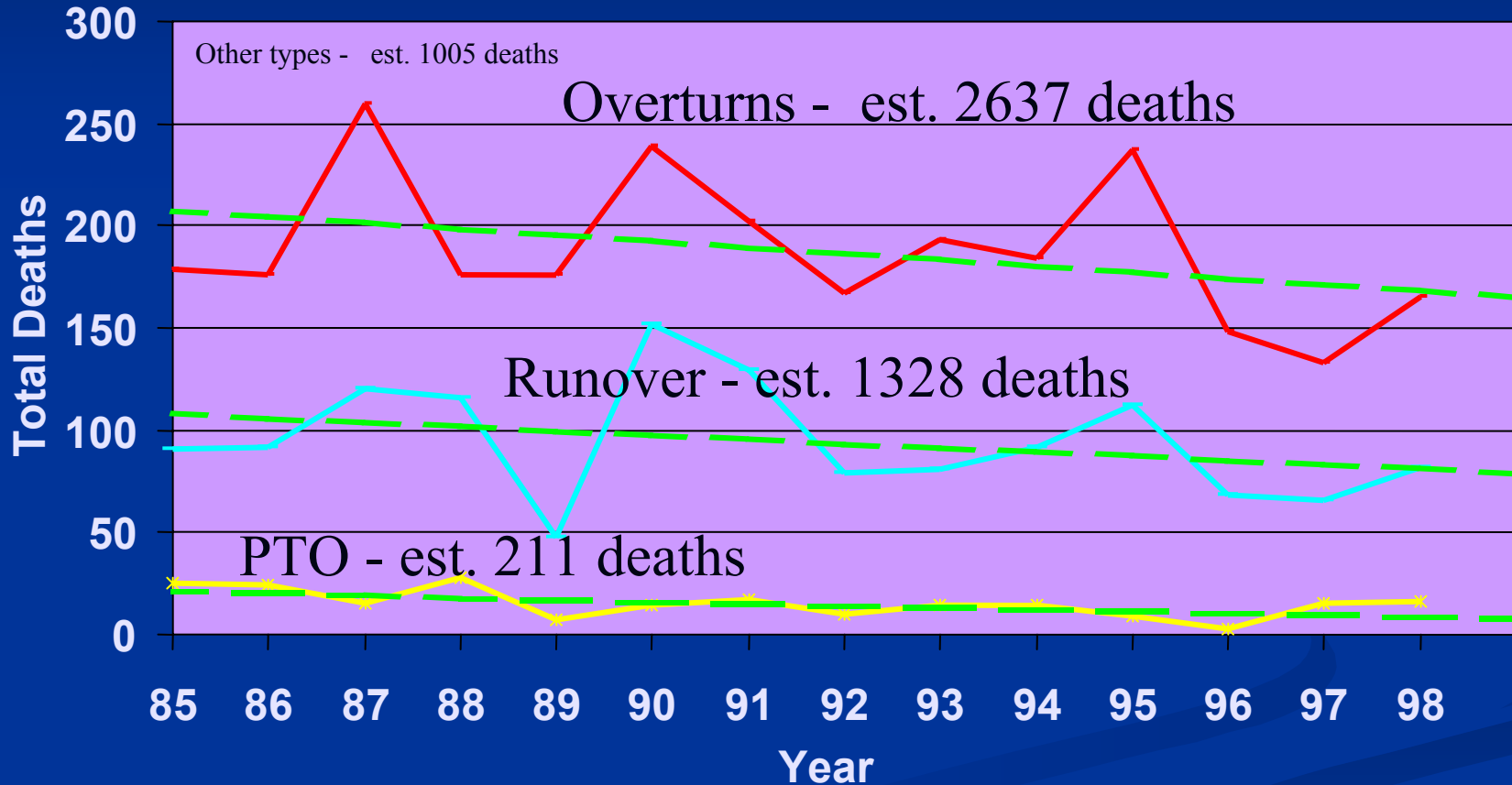
<u>Region</u>	<u>Number</u>	<u>%</u>
Northeast	3093	24.9
South	4165	33.6
Midwest	2974	24.0
West	2170	17.5

Corn Chopper & Loader



Estimated Annual Tractor-Related Deaths

5175 deaths in 14 years



Wagon Overturn



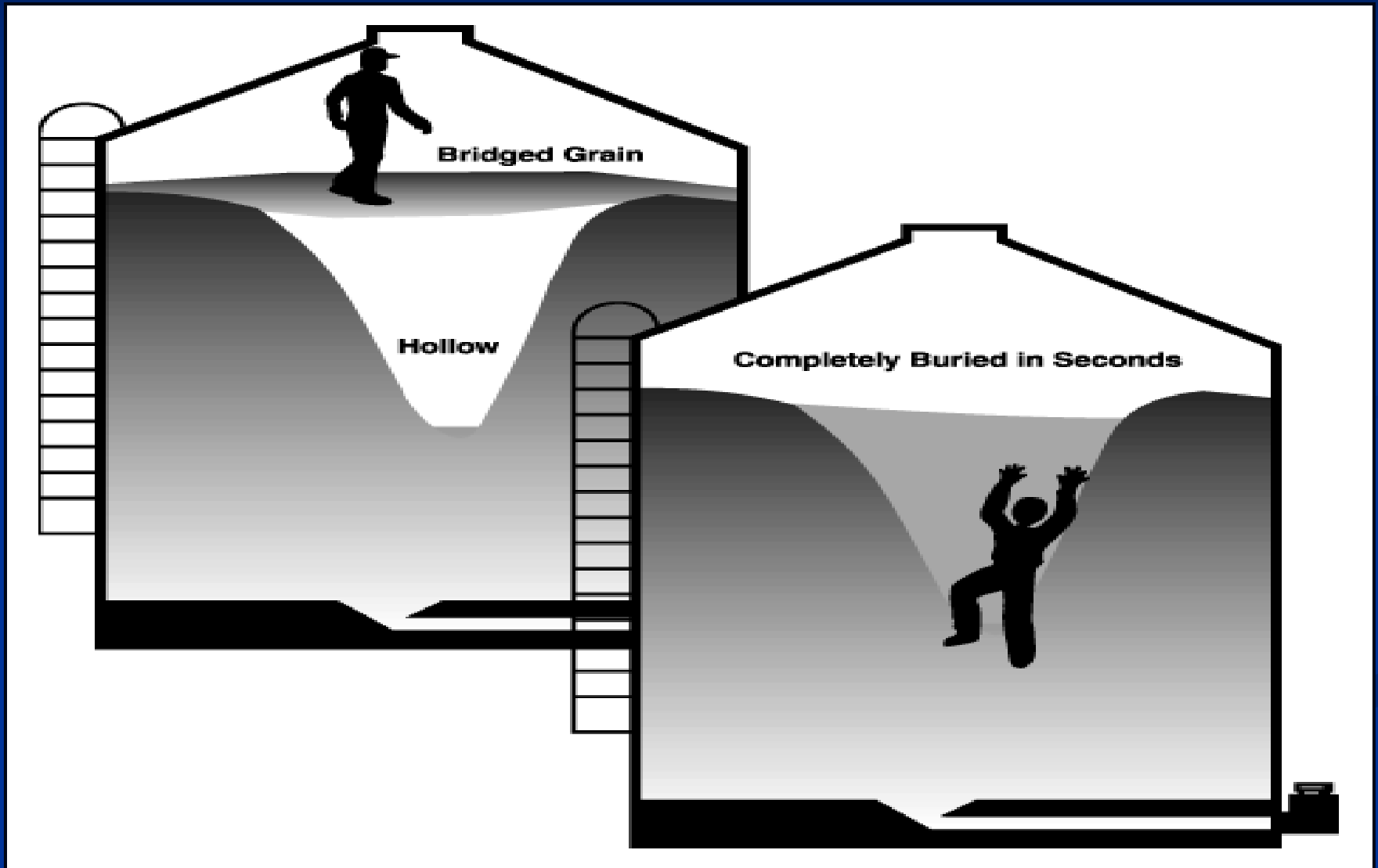
Roll Over Protective Structure (ROPS)



NIOSH Agriculture Alert Examples

- Asphyxiation in Manure Pits
- Entrapment and Suffocation by Unstable Surfaces of Stored Grain and Other Materials
- Grain Auger Electrocutions and Crushes
- Scalping and Other Severe Injuries from Farm Machinery

Circumstances of Grain Entrapment or Suffocation





Pesticide Defined

EPA defines a pesticide as, "... any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, and any substance or mixture of substances intended for use as a plant regulator, defoliant or desiccant."

Pesticides with Limited or Sufficient Evidence of Carcinogenicity in Animals

(sample list, IARC)

<u>Pesticide</u>	<u>Animal Evidence of Carcinogenicity</u>	<u>Currently Registered in US</u>
Herbicides		
■ Amitrole	Sufficient	Y
■ Atrazine	Limited	Y
■ Diallylate	Limited	Y
■ Monuron	Limited	Y
■ Nitrofen	Sufficient	N
Insecticides		
■ Aldrin	Limited	N
■ Arsenic/arsenical compounds	Limited	N/restricted
■ DDT	Sufficient	N
■ Dichlorvos	Sufficient	Y
■ Dicofol	Limited	Y

Pesticide Classes and Specific Cancers

- Phenoxyacetic acid herbicides
 - Soft tissue sarcoma, prostate, Hodgkin's disease, multiple myeloma, stomach, lung, nasal and nasopharyngeal
- Triazine herbicides
 - Ovary
- Arsenical insecticides
 - Lung, skin
- Organochlorine insecticides
 - Leukemia, soft tissue sarcoma, pancreas, skin, lung, liver, breast, neuroblastoma, multiple myeloma

Occupational Groups Potentially Exposed To Pesticides

- Farmers
- Farm workers
- Pesticide manufacturers and formulators
- Pesticide mixer/loaders
- Agricultural pesticide applicators
- Crop duster pilots
- Flaggers for crop duster pilots
- Agricultural extension agents
- Food processors
- Packing house workers
- Fumigation workers
- Grain Millers
- Forestry workers
- Veterinarians
- Pet groomers
- Structural pest control operators
- Military personnel

Occupational Groups Potentially Exposed To Pesticides (cont'd)

- Herbarium curators
- Custodians
- Nursery and greenhouse workers
- Wood preservation workers
- Chemical lawn care workers
- Golf course workers
- Park maintenance workers
- Landscape maintenance workers
- Highway, railway bed, right-of-way maintenance workers
- Mosquito abatement workers
- Textile workers
- Paper and pulp workers
- Paint manufacturers
- Morticians
- Warehouse workers





EXPOSURE SIMULATION USING FLUORESCENT DYE



~ Face and Neck ~



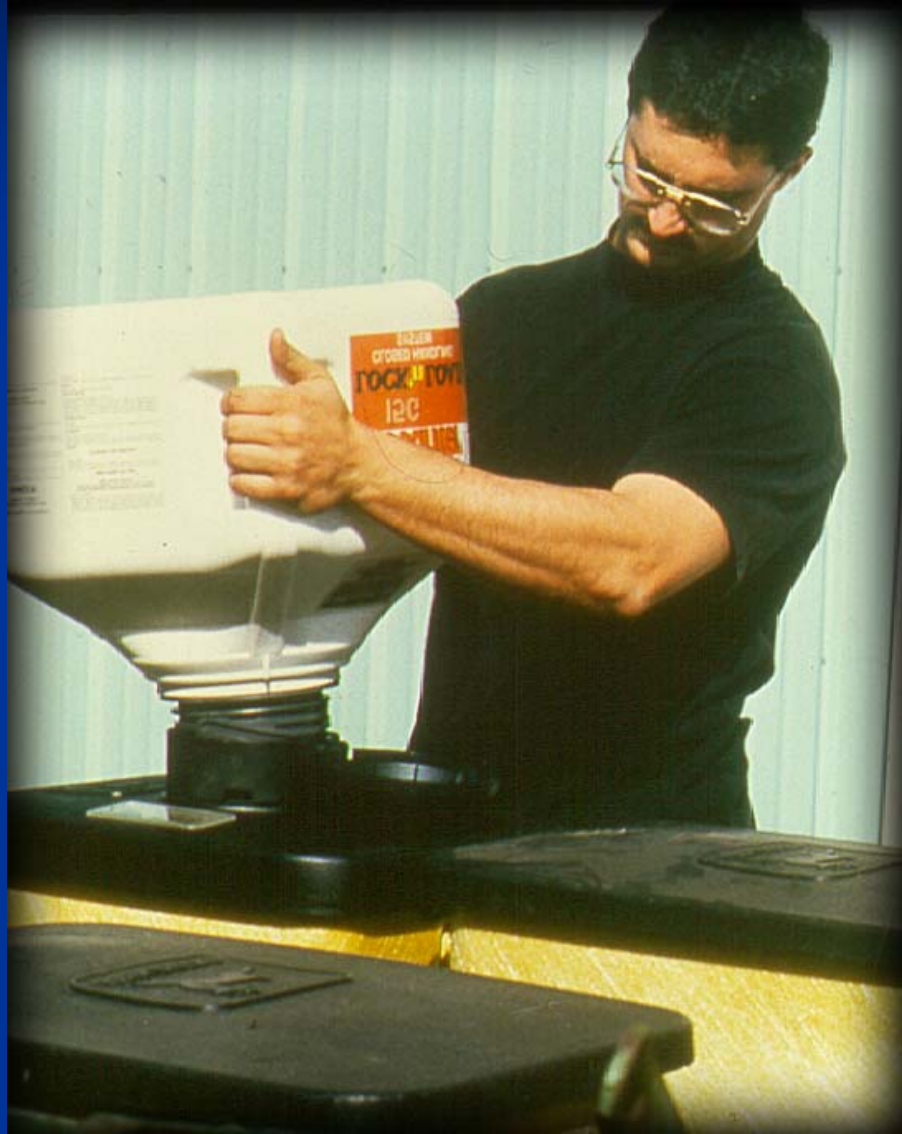
~ Back ~



~ Personal Protective Equipment ~



~ Lock and Load System ~



~ Exposure After Lock and Load ~



~ PERSONAL PROTECTIVE EQUIPMENT

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Frequencies of Chemical-Specific Exposures Among Dairy Farmers (N=267)

Pesticide Applied	Number applying %(N) [of 267]	Exposed Body	Inhaled Vapors	Breathed Large/Medium Amount
Dicamba	38.2 (102)	81.4 (83)	58.8 (60)	4.9 (5)
Atrazine	26.2 (70)	87.1 (61)	47.1 (33)	7.1 (5)
Cyanazine	5.0 (40)	87.5 (35)	7.5 (27)	10.0 (4)
Chlopyrifos	10.1 (27)	7.8 (21)	59.3 (16)	0
Metolachlor	9.4 (25)	84 (21)	48.0 (12)	8.0 (2)
Alachlor	6.7 (18)	83.3 (15)	61.1 (11)	5.6 (1)

~ LABEL REQUIREMENTS ~

Personal Protective Equipment (PPE):

Some materials that are chemical-resistant to this product are listed below. If you want more options, follow the instructions for category C on an EPA chemical resistance category selection chart.

Applicators and other handlers (other than mixers and loaders) must wear:

- long-sleeved shirt and long pants
- chemical-resistant gloves, such as barrier laminate or butyl rubber ≥ 14 mils or nitrile rubber ≥ 14 mils or neoprene rubber ≥ 14 mils or polyvinyl chloride (PVC) ≥ 14 mils or viton ≥ 14 mils
- chemical-resistant footwear plus socks

Mixers and Loaders must wear:

- long-sleeved shirt and long pants
- chemical-resistant gloves, such as barrier laminate or butyl rubber ≥ 14 mils or nitrile rubber ≥ 14 mils or neoprene rubber ≥ 14 mils or polyvinyl chloride (PVC) ≥ 14 mils or viton ≥ 14 mils
- chemical resistant footwear plus socks



Use of Pesticides and Required Personal Protective Equipment Among Farm Applicators (N=220)

<u>Pesticide</u>	<u>Number Applying</u>	<u>Used No Required PPE</u>	<u>Gloves</u>	<u>Goggle</u>	<u>Boots</u>	<u>Apron</u>	<u>Coveralls</u>	<u>Gas Mask</u>	<u>Used All Required PPE</u>
	<u>n (%)*</u>	<u>n (%)</u>	<u>n (%)</u>	<u>n (%)</u>	<u>n (%)</u>	<u>n (%)</u>	<u>n (%)</u>	<u>n (%)</u>	<u>n (%)</u>
dicamba	102(46.4)	58 (56.9)	43 (42.2)	10 (9.8)	--	--	--	--	9 (8.8)
atrazine	70(31.8)	27 (38.6)	40 (57.1)	13(18.6	17(24.3)	--	--	--	6 (8.6)
cyanazine	40(18.2)	19 (47.5)	20 (50.0)	8 (20.0)	8 (20.0)	2 (5.0)	--	--	1 (2.5)
chlopyrifos	27(12.3)	18 (66.7)	7 (25.9)	2 (7.4)	6 (22.2)	0 (0.0)	--	--	0 (0.0)
metolachlr	25(11.4)	11 (44.0)	14 (56.0)	--	--	--	--	--	14 (56.0)
alachlor	18 (8.2)	6 (33.3)	11 (61.1)	2 (11.1)	3 (16.7)	--	--	--	2 (11.1)
imazethpr	16 (7.3)	9 (56.3)	7 (43.8)	--	--	--	--	--	7 (43.8)
terbufos	11 (5.0)	8 (72.7)	3 (27.3)	0 (0.0)	1 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

Health Care Providers, Populations Served and Practice Settings

Agents	Populations Served	Practice Settings
<p>Nurses Nurse Practitioners Physicians Physician Assistants Nurse Midwives Community Health Workers Students in Training Emergency Medical Technicians</p>	<p>Farm owner families Farm worker families Farm community residents Migrant workers Pesticide applicators Extension agents</p>	<p>Hospitals and emergency departments Community clinics Medical centers Independent practices Public health departments Poison control centers Schools Ag community health programs</p>

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