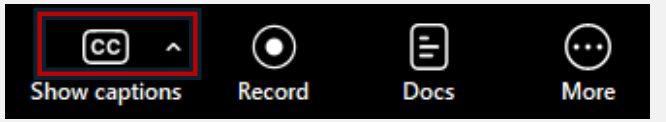
LANGUAGE AND CLOSED CAPTIONING ACCESSIBILITY

1) To activate closed captioning, at the bottom of the Zoom toolbar click the cc icon.



2) To listen to this presentation in Spanish (if applicable), please click on the globe icon and select your preferred language option.

3) To view the Spanish ppt, at the top of the Zoom screen you can select the tab labeled “Español" or "Spanish”

From the Field to the Clinic

Recognizing Pesticide-Related Illness in Children

Wednesday, April 29, 2026

12 pm PT/ 1 pm MT/ 2 pm CT/ 3 pm ET & AT

CONTINUING EDUCATION

FOR CLINICIANS AND NURSING PROFESSIONALS

Migrant Clinicians Network is accredited as a provider of nursing continuing professional development by the American Nurses Credentialing Center's Commission on Accreditation. This presentation has been approved for continuing nursing education.

The AAFP has reviewed *From the Field to the Clinic: Recognizing Pesticide-Related Illness in Children* and deemed it acceptable for up to 1.00 Live AAFP Prescribed credit(s). Term of Approval is from ***April 29, 2026,*** to ***April 29, 2026.*** Physicians should claim only the credit commensurate with the extent of their participation in the activity.

DISCLOSURE OF RELEVANT FINANICAL RELATIONSHIPS

We have no relevant financial relationships that relate to this presentation, nor do we have any relevant financial relationships with ineligible companies whose primary business is producing, marketing, selling, reselling, or distributing healthcare products used by or on patients.

MIGRANT CLINICIANS NETWORK

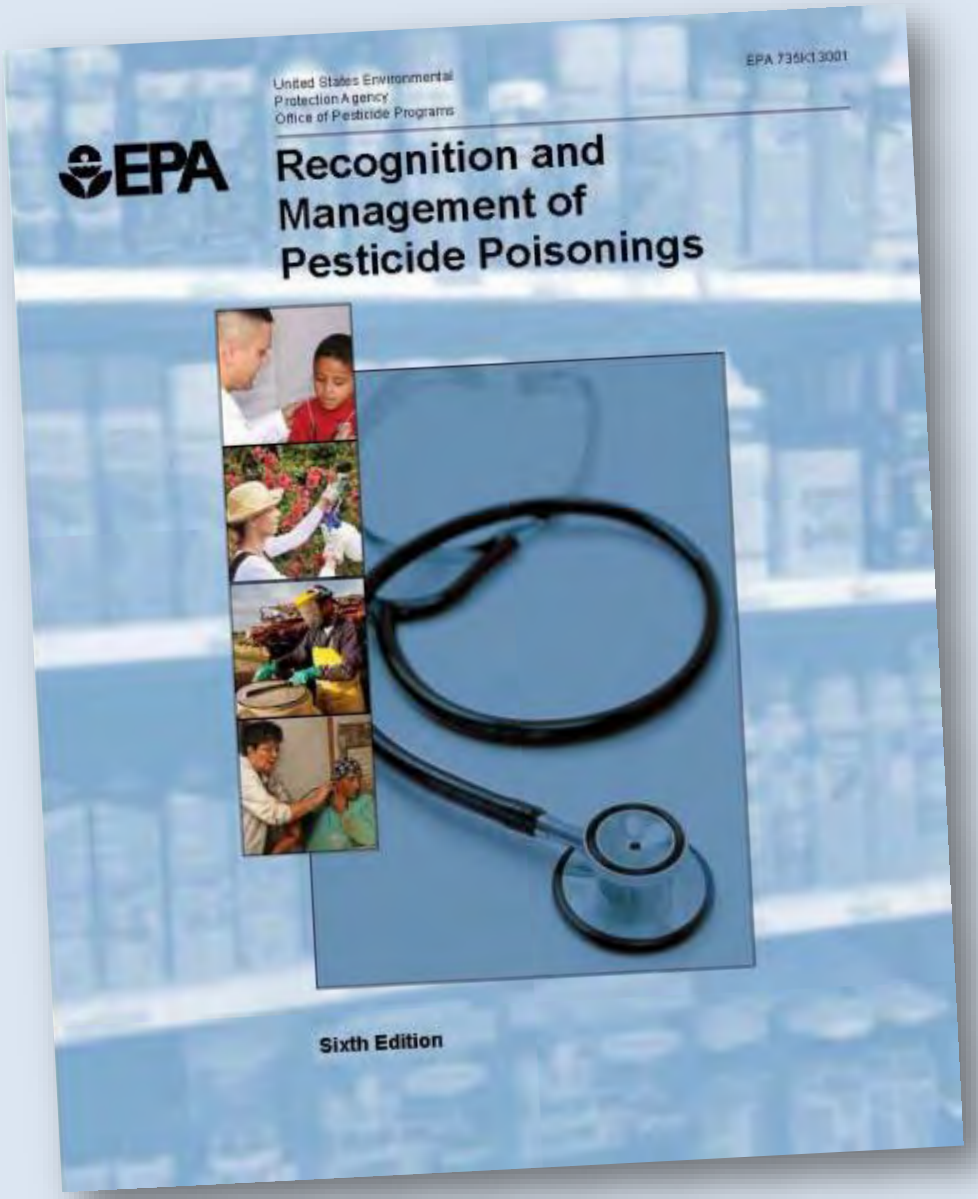
USE OF AI IN CONTINUING EDUCATION ACTIVITIES

MCN is proud to be at the forefront of responsible innovation in education, integrating technologies such as artificial intelligence (AI) to support the development of our accredited continuing education activities. We maintain compliance with the standards of the accrediting agencies regarding the use of AI to augment and not replace professional judgement, maintaining human oversight and accountability. MCN discloses the use of AI applications for graphic design and content support in this educational activity.

MIGRANT CLINICIANS NETWORK

MCN

What is your profession?



Learning Objectives

1. Recognize the signs and symptoms of pesticide exposure in children and adolescents, including common exposure routes.
2. Identify common pediatric exposure scenarios in rural and agricultural settings.
3. Describe clinical and patient resources to help recognize, manage and prevent pesticide-related illness.

Recognition and Management of Pesticide Poisonings, 6th Edition

http://www2.epa.gov/pesticide-worker-safety/recognition-and-management-pesticide-poisonings

Photo © earldotter.com

Pesticide Exposure

- 10,000-20,000 occupational exposures per year in US (EPA 1996)
- Inconsistent and incomplete surveillance system
- Latino farmworkers most exposed
- Over 1 billion pounds of pesticides used each year, mostly in agriculture

World-wide

3 million poisonings

200,000 deaths

Significant underreporting

~ 25 million poisonings (if all cases counted)

98% under-reporting to surveillance systems

(Studies from Central America)

Photo © earldotter.com

If You Remember One Thing…

Photo © earldotter.com

- **80%** of children with organophosphate poisoning were transferred with the wrong diagnosis

- Acute pesticide poisoning may not be relatively common...

- But you need a **high index of suspicion so that it is not missed**

Zweiner RJ, et al. Organophosphate and carbamate poisoning in infants and children Pediatrics 1988;81:121-6.

4 month old child presents to ED

- Fussy, decreased appetite, vomiting, diarrhea, lethargic, limp
- Apnea reported, and en route “eyes roll back in head”
- ED exam: Limp, miosis, poor respiratory effort, increased amount of secretions
- HR 178, RR 34, T 98.6


What is your diagnosis?

4-Month-old now in ICU

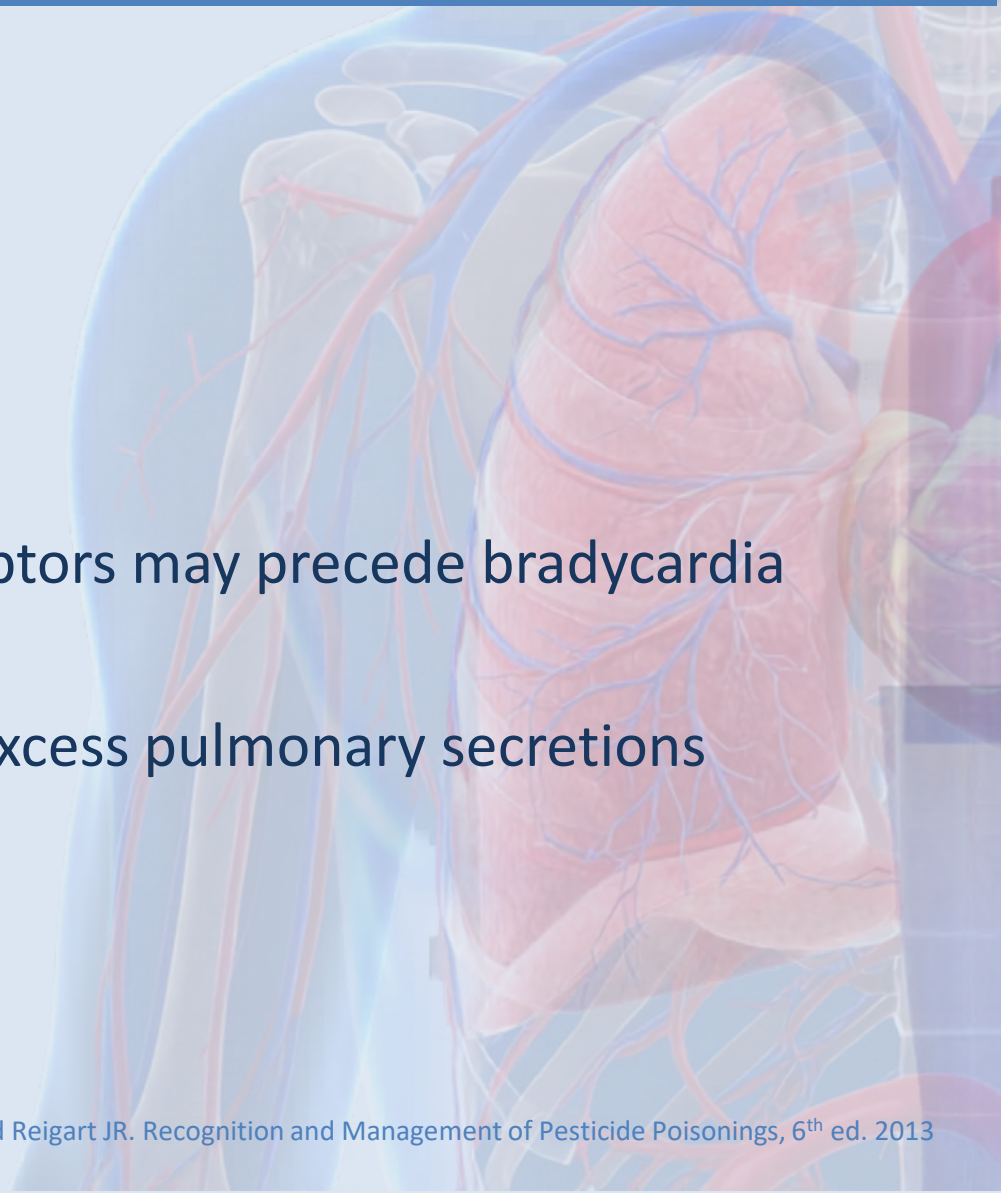
- Further hx: 5 previous hospital admissions, 1 of which OP suspected
- Sepsis workup negative
- Received fentanyl, pralidoxime, atropine
- RBC and plasma cholinesterase levels decreased
- Initial urine, blood, and breast milk samples negative for pesticides/ metabolites
- Baby stabilized, remained in hospital during investigation of home, dad's work

Organophosphate/Carbamate Acute Toxicity

- Phosphorylates acetylcholinesterase (AchE)
  - Excess Ach accumulates in nerve ending
- Classic findings: Hyper-secretion (muscarinic)
  - Salivation, lacrimation, bronchorrhea, perspiration, diarrhea, miosis
  - Less common in children than adults
- Skeletal muscle (nicotinic effects)
  - Excitatory (Muscle fasciculations)
  - Inhibitory (Weakness & paralysis) – this is actually a delayed finding in some cases of OP poisoning

Organophosphate Toxicity

- Central effects
  - Sensory/behavioral disturbance, incoordination
  - Respiratory depression, coma, seizures
- Autonomic ganglia
  - Classically see bradycardia--- sinus arrest
  - Tachycardia and hypertension from nicotinic receptors may precede bradycardia
- Cause of death
  - Respiratory depression (central) exacerbated by excess pulmonary secretions
- Children v. Adults
  - Seizures in 8-39% of children v. 2-3% in adults
  - Lethargy and coma 55%-100% of pediatric cases



Roberts JR and Reigart JR. Recognition and Management of Pesticide Poisonings, 6th ed. 2013

Treatment

- Recovery depends on generation of new enzyme
- Airway, oxygenation, and ventilation
- Atropine reverses some cholinergic effects
  - Frequent doses and higher doses are needed
  - Generally less effective against nicotinic or CNS actions
- Pralidoxime (organophosphate only)
  - Reactivates AchE
- Address possible exposures & report incident

Infant's Home Environment

- Dad and uncle both farmworkers, living with their families in one farm trailer
- Both trained as pesticide handlers
  - Helped move pesticide containers but did not open or spray them
  - Wear same clothes home from field, but report washing them separately
- Moved to different trailer at discharge

Infant's Home Environment

- Tested wipe samples from original trailer
  - 2 different OPs
- Submitted new sample of infant's urine to CDC for further testing
  - Acephate and dimethyl OP metabolites
- Set up decon room away from main living area
  - Still came home and ate lunch at table
  - Changed clothes, but no shower before holding baby

Photo Mario Puerta

Medical School and Residency Training

- In medical school, ~ 7 hours on environmental health (EH) related topics (over all 4 years)[1]
- US pediatric residency spends an average of two hours on EH related material[2]
  - ✓ Highly dependent on presence of faculty with expertise
- Sample of clinicians participating in MCN programs-
  - ✓**78%** of respondents had 2 hours or less of EOH training

[1]Schenk M, et al. *Acad Med* 1996; 71:499-501[2]Roberts JR, Gitterman B. *Amb Peds* 2003;3:57-59

Physician/Medical Student Knowledge of Pesticides

- Clinician to recognize pesticide poisoning by clues in the history and PE

- My experience with students/ residents

  - They often equate “Pesticide” with “Insecticide”
  - Most can recall generalities of OP poisoning
    - No differences between kids and adults
    - A differential diagnosis of pesticides?
  - “Rat poison” equates checking for bleeding
    - No institutional memory of convulsants (strychnine)


PARATION 720
PARATHION METILICO
PELIGRO
VENENO
EXTREMADAMENTE TÓXICO

Commonly Presenting Signs and Symptoms

Seizures

Nausea, vomiting, diarrhea

Respiratory distress, pulmonary edema

Headaches and Mental status changes

- drowsiness
- lethargy
- coma

Skin findings

- rash
- blistering
- contact dermatitis

Cardiovascular

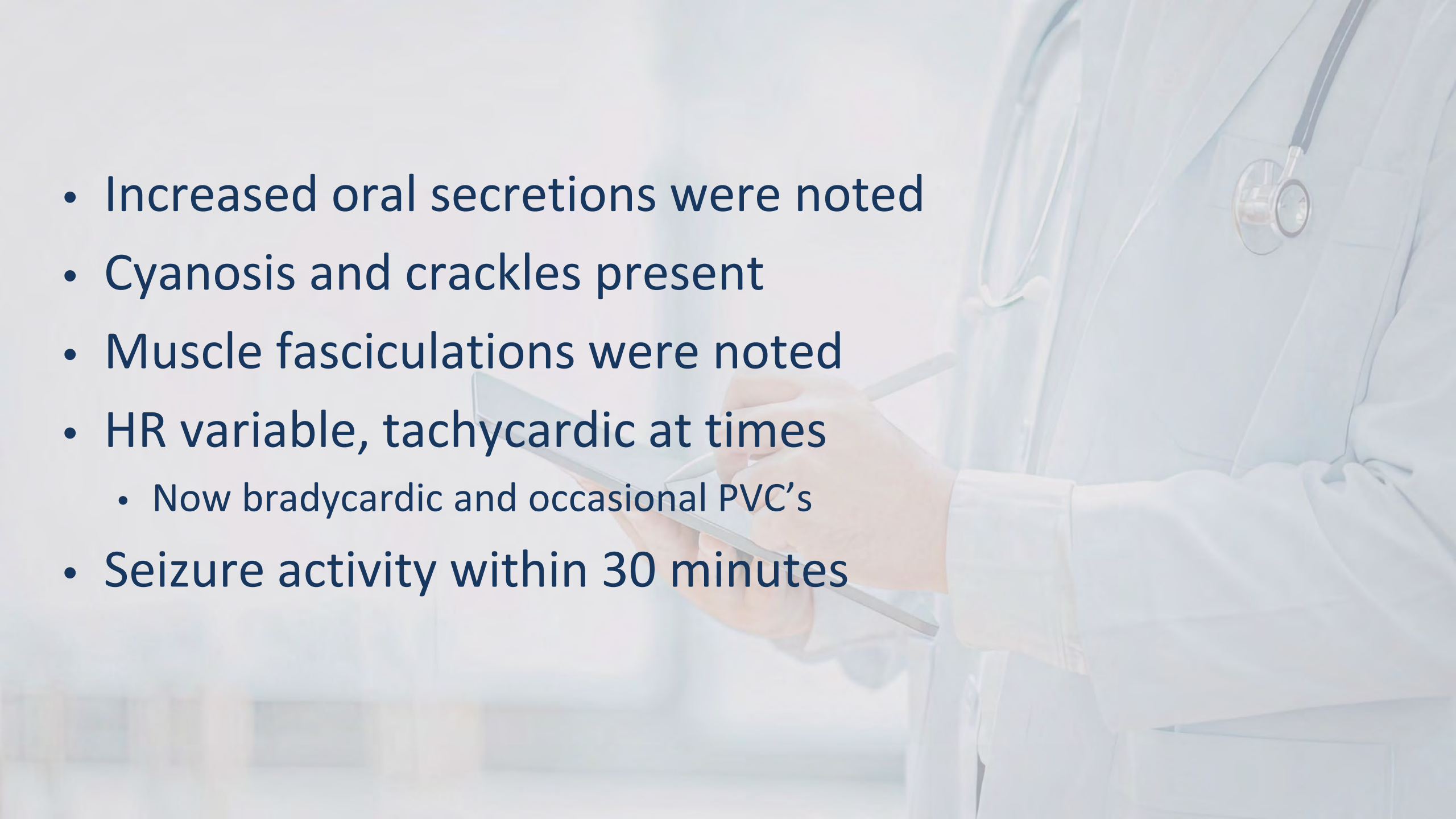
- tachycardia
- bradycardia
- hypotension

Exposure to Family Members

- “Take home” exposure
- Drift
- Home application of pesticides
- Lawn and vegetable and flower gardens

17-year-old with mental status changes

- A semi-comatose patient is brought in by EMS
- Patient initially complained of stinging, burning and numbness on hands, arms and face after working in the fields
- Experienced headache, dizziness, nausea, vomiting
- Mental status changes eventually occurred
- Initially not clear what he was exposed to



- Increased oral secretions were noted
- Cyanosis and crackles present
- Muscle fasciculations were noted
- HR variable, tachycardic at times
  - Now bradycardic and occasional PVC’s
- Seizure activity within 30 minutes

Is this another case of OP poisoning?

Patient Management

- Appropriate decontamination takes place
  - Showered, clothes removed and bagged
  - Hospital employee protection

- Airway and breathing support
  - Seizures controlled with lorazepam
- Treatment with atropine and pralidoxime while awaiting cholinesterase levels

- Our patient is a little better, but still sick and appears different than at presentation
  - Now has flushed and hot, dry skin
  - Mydriasis, increasing tachycardia
- Otherwise responded to supportive care
  - Seizures stopped, more alert
  - Cholinesterase levels within normal limits
- Co-worker confirms use of cypermethrin
  - Type II (“Cyano”-pyrethroid)

Pyrethrins/Pyrethroids

- Used worldwide since the 1970s
- Derived from the Chrysanthemum
- Pyrethrins–Short acting, unstable to heat/light, knockdown effect
  - Used for flying indoor pests, (wasp killer)

- Pyrethroids are synthetically modified
  - Outdoor control, agriculture, ectoparasites
  - Very common in consumer products

Chapter 4

Pyrethrins and Pyrethroids

Page 38

Pyrethrins

HIGHLIGHTS

Strongly lipophilic

Crude pyrethrum is a dermal & respiratory allergen

Easily absorbed by GI tract & pulmonary membranes

Relatively low mammalian toxicity

SIGNS & SYMPTOMS

Contact dermatitis

Rhinitis, asthma

TREATMENT

Antihistamines

Epinephrine for anaphylaxis as required

Topical corticosteroid for contact dermatitis

Flush eyes as necessary

Consider gastric emptying or charcoal adsorption

P. 40

CHAPTER 4

Pyrethrins and Pyrethroids

PYRETHRINS

Pyrethrum is the oleoresin extract of dried chrysanthemum flowers. The extract contains about 50% active insecticidal ingredients known as pyrethrins. The ketoalcoholic esters of chrysanthemic and pyrethroic acids are known as **pyrethrins, cinerins** and **jasmolins**. These strongly lipophilic esters rapidly penetrate many insects and paralyze their nervous systems. Both crude pyrethrum extract and purified pyrethrins are contained in various commercial products, commonly dissolved in petroleum distillates. Some are packaged in pressurized containers ("bug bombs"), usually in combination with the synergists piperonyl butoxide and n-octyl bicycloheptene dicarboximide. The synergists retard enzymatic degradation of pyrethrins. Pyrethrum and pyrethrin products are used mainly for indoor pest control. They are not sufficiently stable in light and heat to remain as active residues on crops. The synthetic insecticides known as pyrethroids (chemically similar to pyrethrins) have the stability needed for agricultural applications. Pyrethroids are discussed separately below.

Toxicology

Crude pyrethrum is a dermal and respiratory allergen, probably due mainly to non-insecticidal ingredients. Contact dermatitis and allergic respiratory reactions (rhinitis and asthma) have occurred following exposures.[1,2] Single cases exhibiting anaphylactic[3] and pneumonitic manifestations[4] have also been reported. Pulmonary symptoms may be due to inhalation of the hydrocarbon vehicle(s) of the insecticides. The refined pyrethrins are probably less allergenic but appear to retain some irritant and/or sensitizing properties.

Pyrethrins are absorbed across the gastrointestinal tract and pulmonary membranes, but only slightly across intact skin. They are very effectively hydrolyzed to inert products by mammalian liver enzymes. This rapid degradation, combined with relatively poor bioavailability, probably accounts in large part for their relatively low mammalian toxicity. Dogs fed extraordinary doses exhibit tremor, ataxia, labored breathing and salivation. Similar neurotoxicity has been rarely observed in humans, even in individuals who have had extensive contact from using pyrethrins for body lice control or have ingested pyrethrum as an anthelmintic.

In cases of human exposure to commercial products, the possible role of other toxicants in the products should be kept in mind. The synergists piperonyl butoxide and n-octyl bicycloheptene dicarboximide have low toxic potential in humans, which is further discussed in **Chapter 19, *Miscellaneous Pesticides, Solvents and Adjuvants.*** However, the hydrocarbon vehicle(s) may have significant toxicity. Pyrethrins themselves do not inhibit the cholinesterase enzymes

Pyrethroids

HIGHLIGHTS

Low systemic toxicity via inhalation and dermal route

Sites of action: sodium & chloride channels; GABA, nicotinic acetylcholine, peripheral benzodiazepine receptors

Type I (*e.g.*, permethrin) usually do not contain a cyano group

Type II (*e.g.*, cypermethrin, fenvalerate) always contain a cyano group

Type II acute poisonings are generally more severe

SIGNS & SYMPTOMS

Type I: fine tremor, reflex hyperexcitability

Type II: severe salivation, hyperexcitability, choreoathetosis

May include dizziness, headache, fatigue, vomiting, diarrhea

Stinging, burning, itching, tingling, numb skin may be reported

Severe cases: pulmonary edema, seizures, coma

TREATMENT

sures, followed by depolarization, conduction block and cell death at very high levels of exposure.[7] In addition to the calcium and sodium channel sites of action, multiple other sites descri effects, see following), e receptors. They have

resistance of mammals ng. However, the possi- ed dosing in adults has metabolize these agents lting neurotoxicity.

Pyrethroids clinical findings with overdosing. Type do not contain a cyano group, while **fenvalerate**, always do.[10] Both of thes amine relea from the adrenals with eve epinephrine results in marked sympathe

There have agents. A report of 466 episodes of illnes gers notes that eight of the ten most com episodes are pyrethroid compounds, repre these cases, 18% were reported as moder severity.

Signs and Sy

Type II acute poi e I.[10] Type I poisoning has been describe hyperexcitability. Type I poisoning ha and choreoath- sis. Other signs l facial sen on, dizzi- headache, fa und and touch In more severe puln and co an develop. A large ingestion ns may cause coma and seizures within 20 minutes. Initial symptoms following ingestion include gastrointestinal events (*i.e.*, abdominal pain, vomiting and diarrhea) generally within 10 to 60 minutes. Of 573 cases reviewed in China, 51 included disturbed consciousness and 34 included seizures. Of those 85 symptomatic cases, only five were from occupational exposure.[12]

A report of illnesses in 27 farmworkers and 4 emergency responders was related to pesticide drift of the pyrethroid **cyfluthrin**.[13] In this episode, the most commonly reported symptoms were headache (96%), nausea (89%), eye irritation (70%), muscle weakness (70%), anxiety (67%) and shortness of breath (64%).[13]

Apart from central nervous system toxicity, some pyrethroids do cause distressing paresthesias when liquid or volatilized materials contact human skin. These symptoms

CHAPTER 4
Pyrethrins & Pyrethroids

Pyrethroids
HIGHLIGHTS

Low systemic toxicity via inhalation and dermal route

Sites of action: sodium & chloride channels; GABA, nicotinic acetylcholine, peripheral benzodiazepine receptors

Type I (*e.g.*, permethrin) usually do not contain a cyano group

Type II (*e.g.*, cypermethrin, fenvalerate) always contain a cyano group

Type II acute poisonings are generally more severe

Pyrethroids

HIGHLIGHTS

Low systemic toxicity via inhalation and dermal route

Sites of action: sodium & chloride channels; GABA, nicotinic acetylcholine, peripheral benzodiazepine receptors

Type I (*e.g.*, permethrin) usually do not contain a cyano group

Type II (*e.g.*, cypermethrin, fenvalerate) always contain a cyano group

Type II acute poisonings are generally more severe

SIGNS & SYMPTOMS

Type I: fine tremor, reflex hyperexcitability

Type II: severe salivation, hyperexcitability, choreoathetosis

May include dizziness, headache, fatigue, vomiting, diarrhea

Stinging, burning, itching, tingling, numb skin may be reported

Severe cases: pulmonary edema, seizures, coma

TREATMENT

sures, followed by depolarization, conduction block and cell death at very high levels of exposure.[7] I sites of action, multiple other sites desc effects, see following), nicotinic acetyl ne receptors. They have also been show

These disc resistance of mammals to these agents ing. However, the possi- bility of neuron ted dosing in adults has been raised.[7] T metabolize these agents could result in h lting neurotoxicity.

Pyrethroid n clinical findings with overdosing. Typ do not contain a cyano group, while n and **fenvalerate**, always do.[10] Both amine release from the adrenals prepinephrine results in marke

agents. A report of 466 gers notes that eight of episodes are pyrethroid these cases, 18% were severity.

ed as mod

Signs and S

Type II acute p pe I.[10] Type I poisoning has been described as characterized by fine tremor and reflex hyperexcitability. Type II poisoning has typically shown severe salivation, hyperexcitability and choreoathetosis. Other signs and symptoms of toxicity include abnormal facial sensation, dizziness, headache, fatigue, vomiting, diarrhea and irritability to sound and touch. In more severe cases, pulmonary edema, muscle fasiculations, seizures and coma can develop. A large ingestion (200 to 500 mL) of concentrated formulations may cause coma and seizures within 20 minutes. Initial symptoms following ingestion include gastrointestinal events (*i.e.*, abdominal pain, vomiting and diarrhea) generally within 10 to 60 minutes. Of 573 cases reviewed in China, 51 included disturbed consciousness and 34 included seizures. Of those 85 symptomatic cases, only five were from occupational exposure.[12]

A report of illnesses in 27 farmworkers and 4 emergency responders was related to pesticide drift of the pyrethroid **cyfluthrin**.[13] In this episode, the most commonly reported symptoms were headache (96%), nausea (89%), eye irritation (70%), muscle weakness (70%), anxiety (67%) and shortness of breath (64%).[13]

Apart from central nervous system toxicity, some pyrethroids do cause distressing paresthesias when liquid or volatilized materials contact human skin. These symptoms

SIGNS & SYMPTOMS

Type I: fine tremor, reflex hyperexcitability

Type II: severe salivation, hyperexcitability, choreoathetosis

May include dizziness, headache, fatigue, vomiting, diarrhea

Stinging, burning, itching, tingling, numb skin may be reported

Severe cases: pulmonary edema, seizures, coma

P. 40

Signs and Symptoms of Poisoning

Type II acute poisonings are generally more severe than Type I.[10] Type I poisoning has been described as characterized by fine tremor and reflex hyperexcitability. Type II poisoning has typically shown severe salivation, hyperexcitability and choreoathetosis. Other signs and symptoms of toxicity include abnormal facial sensation, dizziness, headache, fatigue, vomiting, diarrhea and irritability to sound and touch. In more severe cases, pulmonary edema, muscle fasiculations, seizures and coma can develop. Seizures within 20 minutes. Initial symptoms following ingestion include gastrointestinal events (*i.e.*, abdominal pain, vomiting and diarrhea) generally within 10 to 60 minutes. Of 573 cases reviewed in China, 51 included disturbed consciousness and 34 included seizures. Of those 85 symptomatic cases, only five were from occupational exposure.[12]

A report of illnesses in 27 farmworkers and 4 emergency responders was related to pesticide drift of the pyrethroid **cyfluthrin**.[13] In this episode, the most commonly reported symptoms were headache (96%), nausea (89%), eye irritation (70%), muscle weakness (70%), anxiety (67%) and shortness of breath (64%).[13]

Apart from central nervous system toxicity, some pyrethroids do cause distressing paresthesias when liquid or volatilized materials contact human skin. These symptoms are more common with exposure to the Type II pyrethroids than the Type I.[6] Sensations are described as stinging, burning, itching and tingling, progressing to numbness.[12,14,15] Thus, skin wetness and water enhance the disagreeable sensations. Sometimes the paresthetic effect is noted within minutes of exposure, but a 1-2 hour delay in appearance of symptoms is more common.[14,16] Sensations rarely persist more than 24 hours.[7] Little or no inflammatory reaction is apparent where the paresthesias are reported; the effect is presumed to result from pyrethroid contact with sensory nerve endings in the skin. The paresthetic reaction is not allergic in nature, though sensitization and allergic responses have been

“Other Insecticides”
Neonicotinoids (Imidacloprid) and Fipronil

- Both introduced in US market in 1990s
- Neonicotinoids are used in agriculture and for flea control
- Fipronil used in agriculture, lawn treatments, roach bait stations, household pet application
- Less human toxicity

Index of Signs and Symptoms

Starts on Page 244

P. 254

Gastrointestinal Tract and Liver

Liver

Kidney

SYSTEM: GI Tract and Liver, cont.				
	Abdominal pain	Abdominal pain	Organophosphates N-methyl carbamates Paraquat Diquat Nicotine Metaldehyde Fluoride Borate Phosphorous Phosphides Inorganic arsenicals Cadmium compounds Copper compounds Thallium Organotin compounds Neonicotinoids	Chlorophenoxy compounds Aliphatic acids Sodium chlorate Creosote Endothall Aminopyridine Coumarins Indandiones Fumigants (ingested) Cycloheximide
	Ileus	Ileus	Thallium Diquat	Pyriminil
	Constipation	Constipation	Pyriminil	

SYSTEM: Liver	SYMPTOMS/ SIGNS/DISEASE CATEGORIES		
	Enlargement		
	Jaundice *(see section on Skin)*		

SYSTEM: Kidney	SYMPTOMS/ SIGNS/DISEASE CATEGORIES	CHARACTERISTIC OF THESE POISONINGS	MAY OCCUR IN THESE POISONINGS
	Proteinuria/hematuria and acute renal failure	Inorganic arsenicals Copper compounds Sodium fluoride Naphthalene Borate Nitrophenols	Cadmium compounds Phosphorus Phosphides Phosphine Chlorophenoxy compounds

P. 254

Gastrointestinal Tract and Liver

Liver

Kidney

SYSTEM: GI Tract and Liver, cont.			
	Abdominal pain	Organophosphates N-methyl carbamates Paraquat Diquat Nicotine Metaldehyde Fluoride Borate Phosphorous Phosphides Inorganic arsenicals Cadmium compounds Copper compounds Thallium Organotin compounds Neonicotinoids	Chlorophenoxy compounds Aliphatic acids Sodium chlorate Creosote Endothall Aminopyridine Coumarins Indandiones Fumigants (ingested) Cycloheximide
	Ileus	Thallium Diquat	Pyriminil
	Constipation	Pyriminil	

SYSTEM: Liver	SYMPTOMS/ SIGNS/DISEASE CATEGORIES	CHARACTERISTIC OF THESE POISONINGS	MAY OCCUR IN THESE POISONINGS
	Enlargement	Copper compounds Sodium chlorate Phosphine Carbon tetrachloride Chloroform	Inorganic arsenicals Hexachlorobenzene
	Jaundice (*see section on Skin*)		

SYSTEM: Kidney	SYMPTOMS/ SIGNS/DISEASE CATEGORIES		
	Proteinuria/hematuria and acute renal failure	Copper compounds Sodium fluoride Naphthalene Borate Nitrophenols	Phosphorus Phosphides Phosphine Chlorophenoxy compounds

Pesticides Known to Cause Seizures/Tremors

- Insecticides
  - Organochlorines, organophosphates, pyrethroids, nicotine, fipronil
- Rodenticides
  - Strychnine, sodium fluoroacetate, thallium, Al- and Zn phosphide
- Herbicides
  - Diquat, chlorophenoxy compounds (2,4-D)
- Fumigants
  - Cyanide, carbon disulfide, acrylonitrile, methyl bromide

Data Collection of an Acutely Exposed Patient

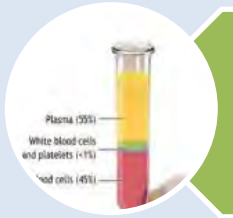
Are we done yet?

Data Collection on an Acute Pesticide Exposed Patient

Pesticide Label and/or Safety Data Sheet (SDS)

Copy of pesticide application record

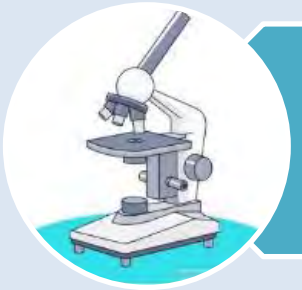
10 cc whole blood, anticoagulated with sodium heparin



5 cc plasma anticoagulated with sodium heparin

A fresh urine sample

Any contaminated clothing



Other options

- Fingernail Residue
- Saliva Sample
- Hair Sample
- Skin wipe

Acute Pesticide Exposures Clinical Guidelines

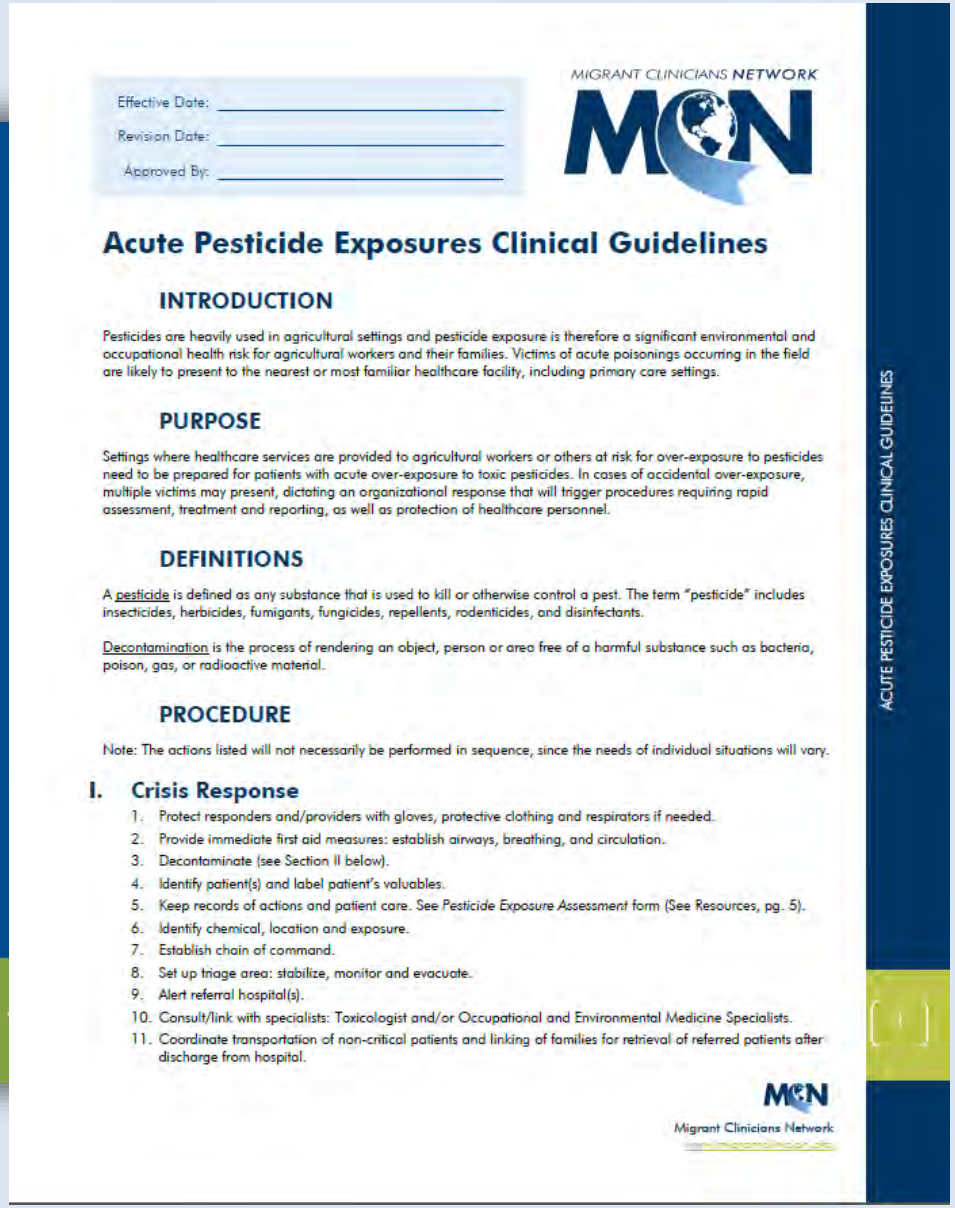
III. Data Collection on an Acute Pesticide Exposed Patient

See *Evaluation Pesticide Exposure* form

1. Patient identification: Name/Age/Sex/Occupation
2. Place of employment
3. Initial and subsequent symptoms and signs*
4. Name of pesticide product including active ingredients, their concentration and EPA registration number
5. Date, time and location when over-exposure occurred
6. How the pesticide was applied, when applied and on what crop or for what use
7. Route(s) of exposure: dermal, ocular, oral, respiratory
8. How much of the product was ingested, if ingested
9. Circumstances of exposure–intentional or accidental, occupational or non-occupational
10. A detailed description of how the exposure happened
11. Others affected or witnessing incident (at work site, home, etc.)
12. If female, assess pregnancy status
13. Treatment already received

    a. Skin exposure:
    - Was affected area washed? If so, when? If not, proceed with skin decontamination procedures
    - Was any clothing contaminated?
    - If so did they change clothes?

    b. Ocular exposure:
    - Were the eyes irrigated?
    - If so, with what and for how long?



Effective Date: _____

Revision Date: _____

Approved By: _____

MIGRANT CLINICIANS NETWORK

MCN

Acute Pesticide Exposures Clinical Guidelines

INTRODUCTION

Pesticides are heavily used in agricultural settings and pesticide exposure is therefore a significant environmental and occupational health risk for agricultural workers and their families. Victims of acute poisonings occurring in the field are likely to present to the nearest or most familiar healthcare facility, including primary care settings.

PURPOSE

Settings where healthcare services are provided to agricultural workers or others at risk for over-exposure to pesticides need to be prepared for patients with acute over-exposure to toxic pesticides. In cases of accidental over-exposure, multiple victims may present, dictating an organizational response that will trigger procedures requiring rapid assessment, treatment and reporting, as well as protection of healthcare personnel.

DEFINITIONS

A pesticide is defined as any substance that is used to kill or otherwise control a pest. The term "pesticide" includes insecticides, herbicides, fumigants, fungicides, repellents, rodenticides, and disinfectants.

Decontamination is the process of rendering an object, person or area free of a harmful substance such as bacteria, poison, gas, or radioactive material.

PROCEDURE

Note: The actions listed will not necessarily be performed in sequence, since the needs of individual situations will vary.

I. Crisis Response

1. Protect responders and/providers with gloves, protective clothing and respirators if needed.
2. Provide immediate first aid measures: establish airways, breathing, and circulation.
3. Decontaminate (see Section II below).
4. Identify patient(s) and label patient's valuables.
5. Keep records of actions and patient care. See *Pesticide Exposure Assessment* form (See Resources, pg. 5).
6. Identify chemical, location and exposure.
7. Establish chain of command.
8. Set up triage area: stabilize, monitor and evacuate.
9. Alert referral hospital(s).
10. Consult/link with specialists: Toxicologist and/or Occupational and Environmental Medicine Specialists.
11. Coordinate transportation of non-critical patients and linking of families for retrieval of referred patients after discharge from hospital.

MCN Migrant Clinicians Network

I am required to report the following:

ABOUT | OUR WORK | RESOURCES | TOPICS | CONNECT | WEBINARS | ARTICLES | Leer en Español

WEBINARS & ONLINE TRAININGS

RECEIVE MCN UPDATES

REQUEST TECHNICAL ASSISTANCE

ENROLL A PATIENT IN HEALTH NETWORK

DOWNLOAD MCN COMICS

MCN'S RESOURCE HUBS

SEARCH ALL RESOURCES

VACCINES

DISASTER PREPAREDNESS

RESPIRATORY DISEASE & COVID

RESPIRATORY HEALTH & PROTECTION

DAIRY WORKER SAFETY

H5N1 AVIAN FLU

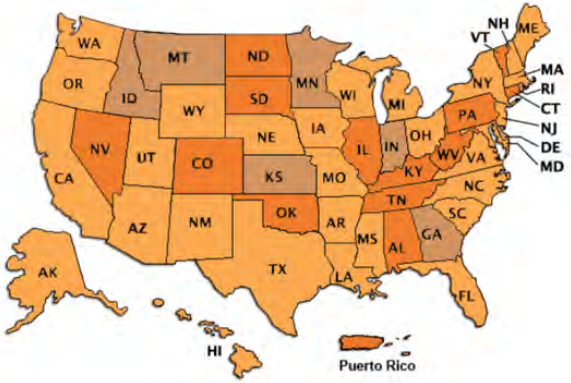
PESTICIDES

HEAT

ENVIRONMENTAL EDUCATION

Pesticide Reporting and Workers' Compensation in Agriculture - Interactive Map

State Pesticide Reporting

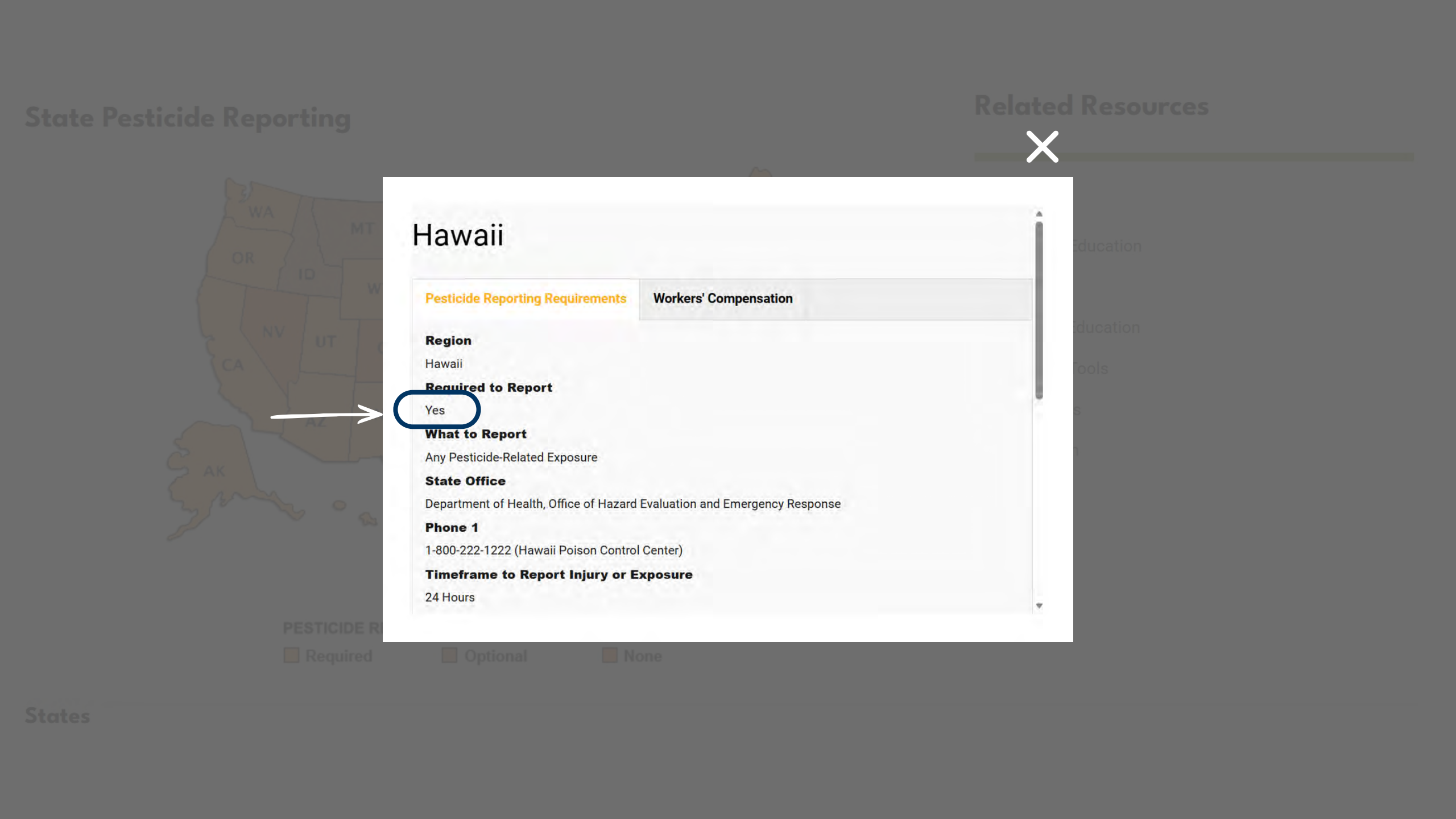


Related Resources

Pesticides

- Clinical Education
- Links
- Patient Education
- Clinical Tools
- Protocols
- Research

States


State Pesticide Reporting
Related Resources
WA
MT
OR
ID
NV
UT
CA
AZ
AK
Hawaii
Pesticide Reporting Requirements
Workers' Compensation
Region
Hawaii
Required to Report
Yes
What to Report
Any Pesticide-Related Exposure
State Office
Department of Health, Office of Hazard Evaluation and Emergency Response
Phone 1
1-800-222-1222 (Hawaii Poison Control Center)
Timeframe to Report Injury or Exposure
24 Hours
Required
Optional
None
States

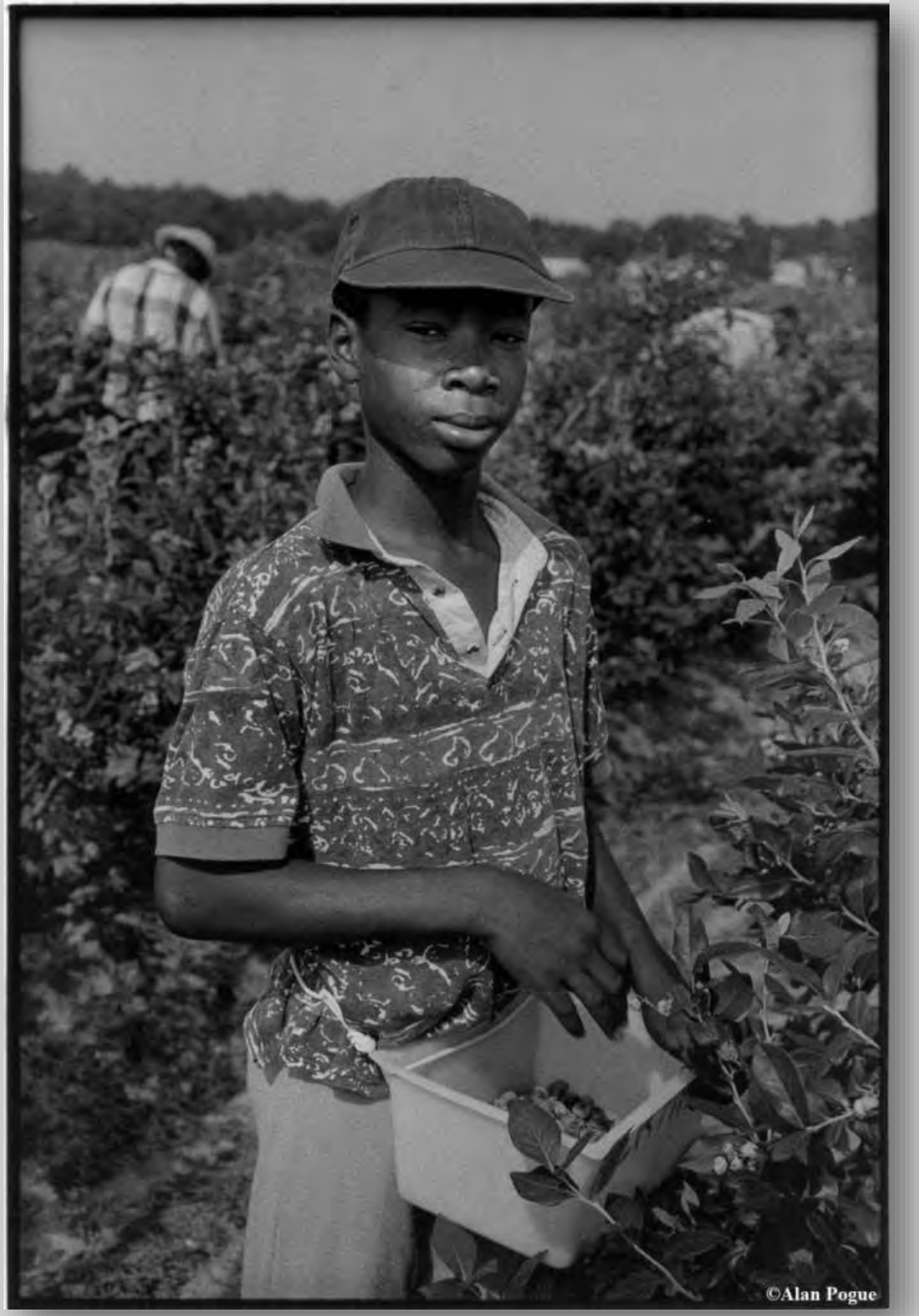
Children Work in Agriculture

What is the minimum age to handle pesticides?

Minimum Age

- Pesticide handlers and early-entry workers (entering during REI) must be at least 18 years old

- Members of owner's immediate family are exempt from this requirement



Worker Protection Standard for Agricultural Pesticides

Intended to reduce the risks of illness or injury to workers and handlers resulting from occupational exposures to pesticides in the production of agricultural plants

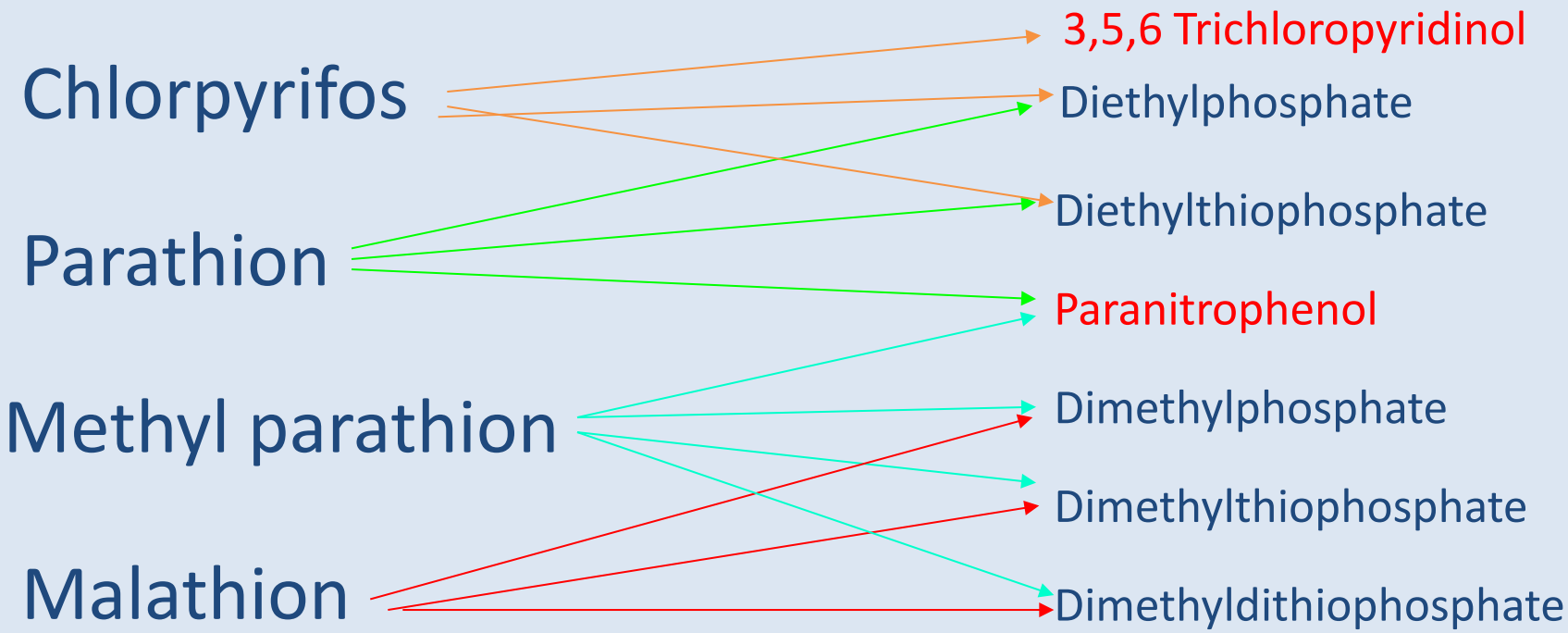
Federal Regulation- 1974 EPA published 40 CFR, Part 170

- Inform
- Protect
- Mitigate

Measuring Pesticide Levels in Children

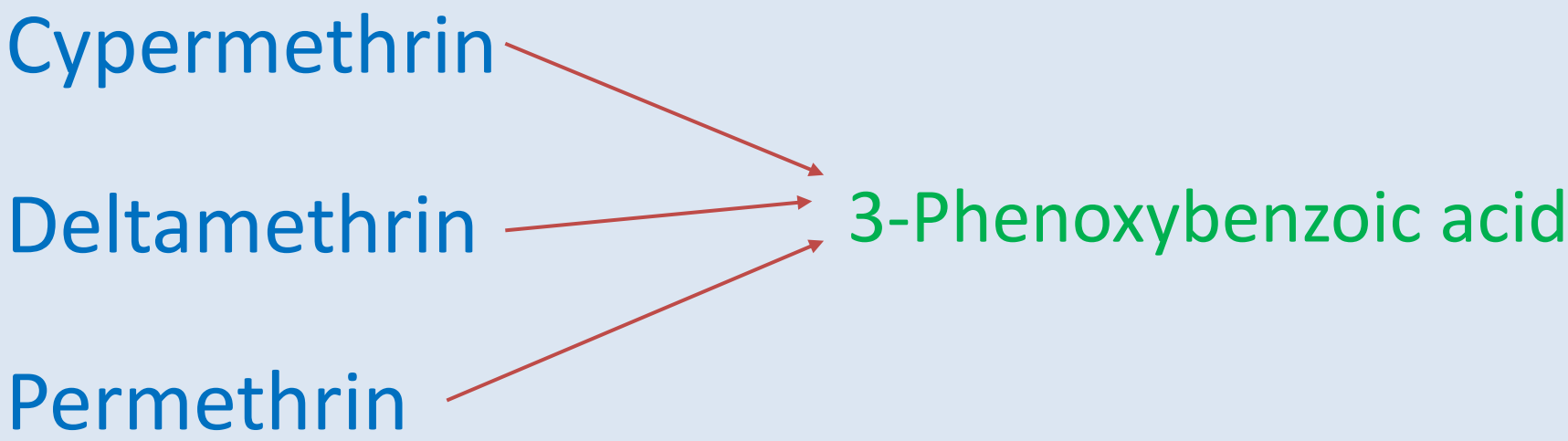
Organophosphate Metabolites

Di-alkyl phosphates (DAP)



Children's urine measurements

Pyrethroid Metabolites (Found in children's urine)



Chapter 21
Chronic Effects

- Increasing information about Chronic effects
- Neurodevelopmental
  - Growing body of solid longitudinal studies
  - Insecticides (OP) affect memory, cognitive development, reasoning, and IQ
- Birth Defects
  - Some evidence to suggest association
- Cancer
  - Childhood ALL
  - Prostate cancer and NHL

Pesticides and Childhood Cancer

- Leukemia and brain tumors have been noted in many epidemiological studies to be associated with pesticides

- Risk factors
  - parental occupational exposure
  - family use-- pest strips, termite treatment, flea collars for pets
  - Parental exposure to pesticides BEFORE and DURING pregnancy

- Multiple studies
  - Two important review articles

Zahm S and Ward M. *Env Health Persp* 1998;106:893-908.Infante-Rivard C &Weichenthal S. *J Tox Environ Health* 2007;10:81-99.

ADHD and Autism
Associations with Pesticide exposure

- Basic science supports several mechanistic effects where pesticides alter brain development
  - Critical windows of development and exposure timing
  - Genetics and the environment
  - Animal studies demonstrate associations
- 1 case control and 7 cohort studies
  - Inattention, behavioral problems, and Dx of ADHD
  - DAPs, Chlorpyrifos specific, hexachlorobenzene, DDT and metabolites
- 6 cohort studies with dx of autism or pervasive dev. Delays
  - Organochlorines in 2 studies, DAPs in 4 studies

Roberts JR, Dawley EH, Reigart JR. Pediatric Research 2019

So what do we do?

- Recognize occupation - patient and parent
- Recognize and treat acute poisoning
- Report
- Promote primary prevention
- Ask about take home exposures
- Become involved in local/state/federal policy

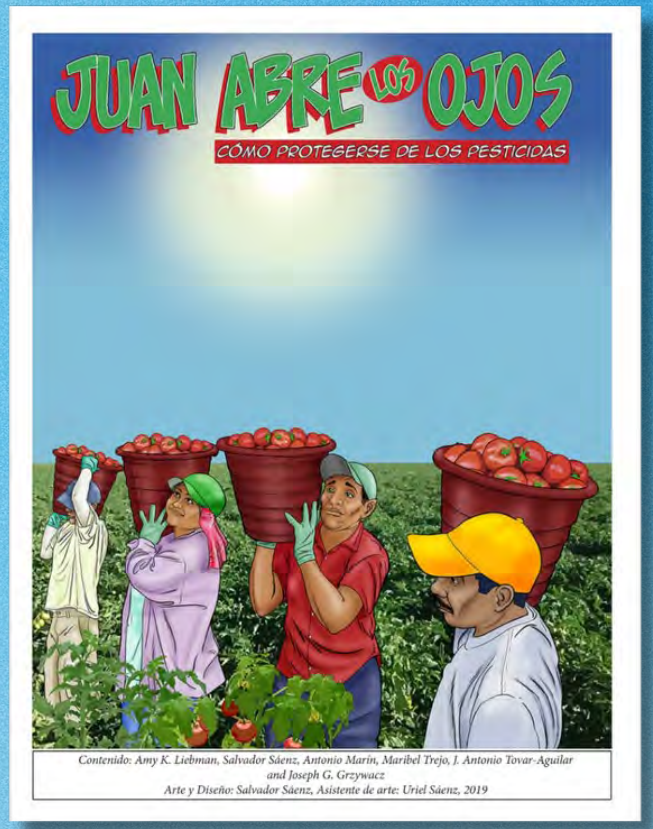
Summary

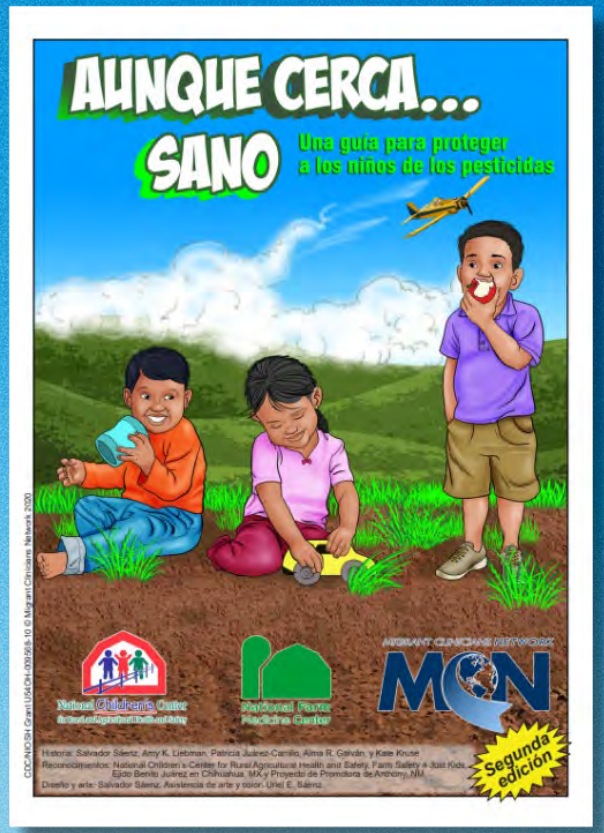
- Pesticides may have both Acute and/or Chronic effects
  - Higher short-term exposure most often associated with Acute effects
  - Chronic effects may occur as late occurrence following a high exposure, or sub-acute exposure

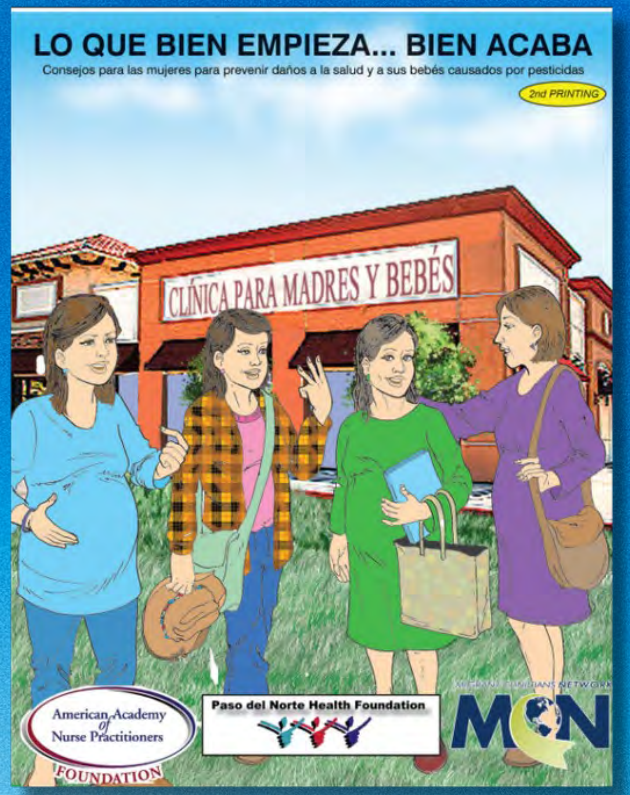
- Acute effects may often be non-specific
  - Helpful patterns or unique symptoms
  - Needs a high index of suspicion

Resources www.migrantclinician.org

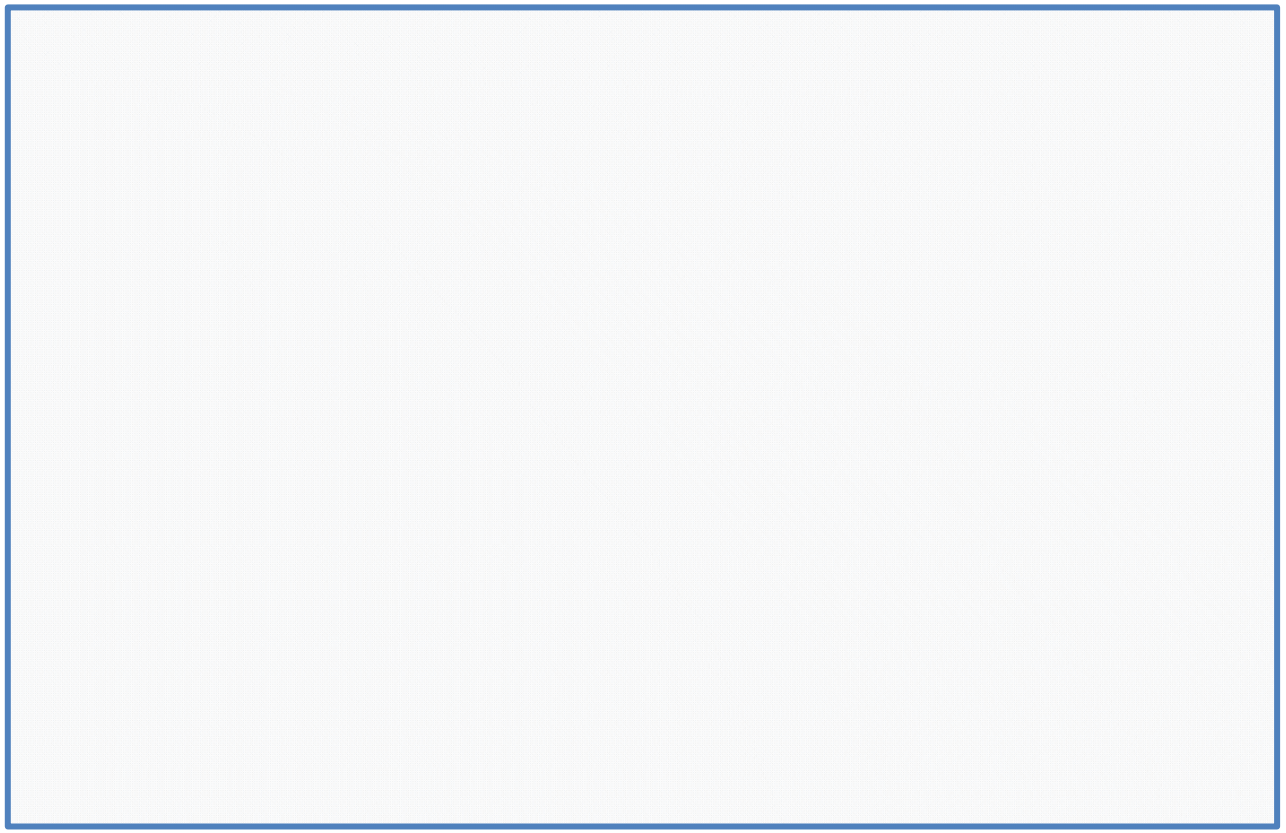
Comic books on Pesticide Safety







www.migrantclinician.org/pesticides



MCN Pesticides Webpage

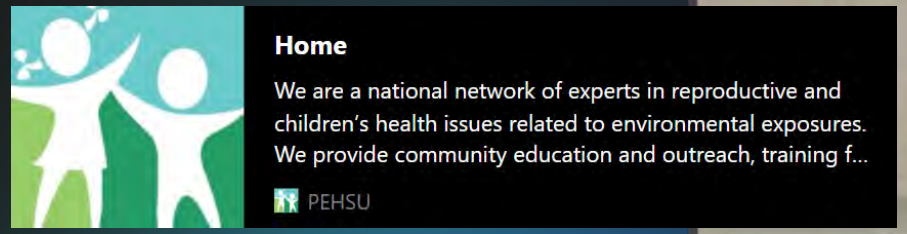
- ✓ Pesticide Exposure Reporting and Workers' Compensation – Interactive Map
- ✓ Links to view and download comic books on pesticide safety
- ✓ Clinical Tools and Guidelines

MIGRANT CLINICIANS NETWORK

MCN

We're on

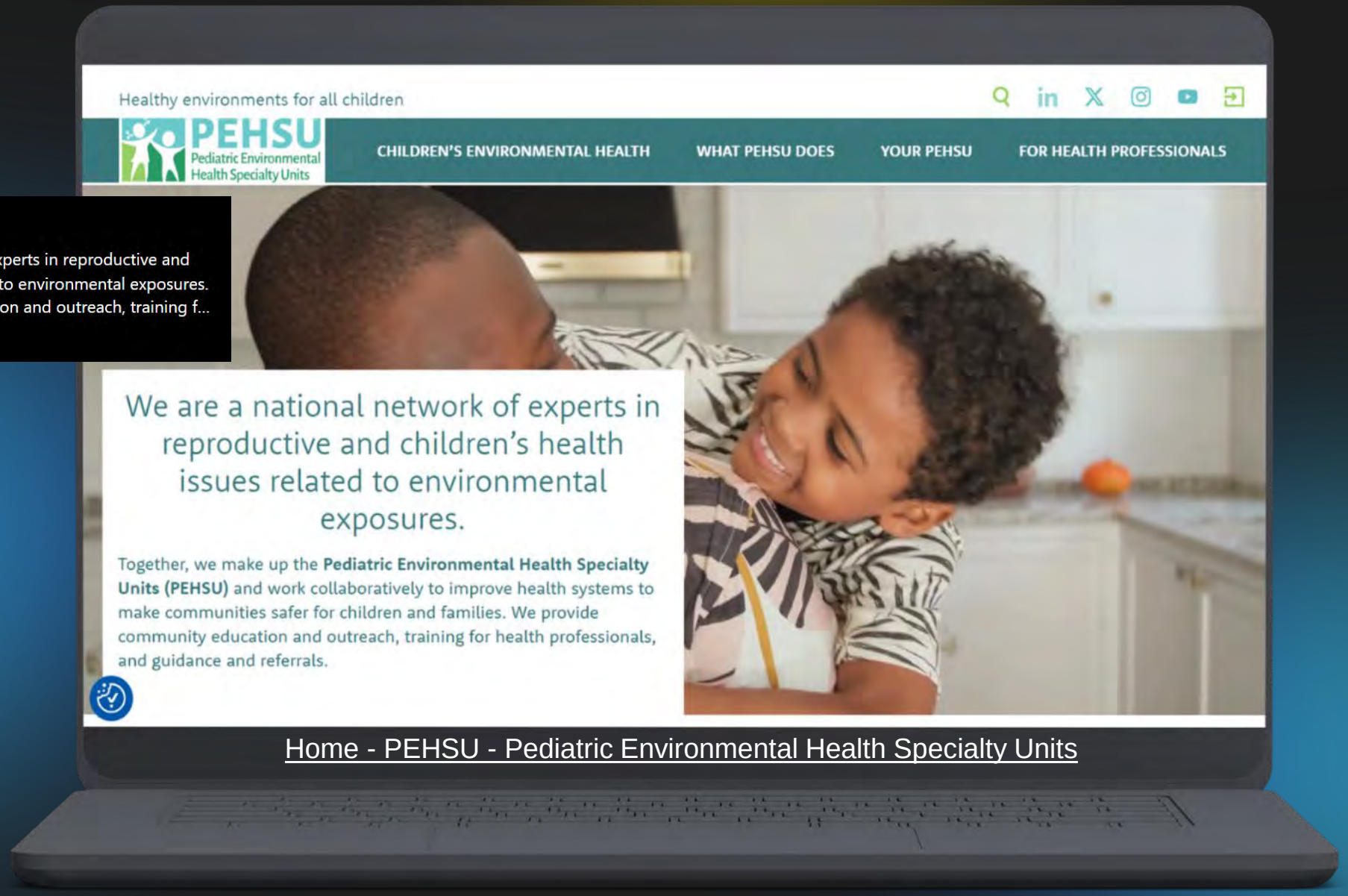
substack



Home

We are a national network of experts in reproductive and children's health issues related to environmental exposures. We provide community education and outreach, training f...

PEHSU



Home - PEHSU - Pediatric Environmental Health Specialty Units

Connect with MCN

[Access our latest resources]

[Get updates from the field]

[Attend our virtual trainings]

@migrantclinicians

YouTube @MigrantCliniciansNetwork

@migrantclinicians.bsky.social

@migrantclinician

@migrantcliniciansnetwork

and a lot more at http://www. ***www.migrantclinician.org***

Evaluation

English Link: **From the Field to the Clinic: Recognizing Pesticide-Related Illness in Pediatrics – Fill out form**

Spanish link: **Del campo a la clínica:**

MIGRANT CLINICIANS NETWORK MCN + GREAT NONPROFITS

If you love MCN's work, tell the world by leaving us a review!

bit.ly/reviewMCN

We are 10 reviews away from being a 2026 Top-Rated Nonprofit

Contact

Amy K. Liebman, MPA, MA
Chief Program Officer
Migrant Clinicians Network
aliebman@migrantclinician.org

James Roberts, MD, MPH
Professor of Pediatrics
Medical University of South Carolina
robertsj@musc.edu

***Disclaimer**: This material was produced, in part, under Cooperative Agreement No. X84115801 awarded by the U.S. Environmental Protection Agency. It has not been formally reviewed by EPA. EPA does not endorse any products or commercial services mentioned in this product.*

References

- Roberts, J. R., & Reigart, J. R. (2013). *Recognition and management of pesticide poisonings* (6th ed.). U.S. Environmental Protection Agency. https://www.epa.gov/pesticide-worker-safety/recognition-and-management-pesticide-poisonings
- Zwiener, R. J., & Ginsburg, C. M. (1988). Organophosphate and carbamate poisoning in infants and children. *Pediatrics, 81*(1), 121–126.
- Schenk, M., Popp, S. M., Neale, A. V., Demers, R. Y. (1996). Environmental medicine content in medical school curricula, *Academic Medicine, 71*(5), 499–501. https://doi.org/10.1097/00001888-199605000-00022
- Roberts, J. R., & Gitterman, B. A. (2003). Pediatric environmental health education: a survey of US pediatric residency programs. *Ambulatory pediatrics : the official journal of the Ambulatory Pediatric Association, 3*(1), 57–59. https://doi.org/10.1367/1539-4409(2003)003<0057:peheas>2.0.co;2
- MCN Pesticide Exposure Clinical Guidelines and Assessment Form https://www.migrantclinician.org/resource/mcn-pesticide-exposure-clinical-guidelines-and-assessment-form.html
- Pesticide Reporting and Workers' Compensation in Agriculture - Interactive Map https://www.migrantclinician.org/pesticide-reporting-and-workers-compensation-agriculture-interactive-map.html?language=en
- Zahm, S. H., & Ward, M. H. (1998). Pesticides and childhood cancer. *Environmental health perspectives, 106 Suppl 3*(Suppl 3), 893–908. https://doi.org/10.1289/ehp.98106893
- Infante-Rivard, C., & Weichenthal, S. (2007). Pesticides and childhood cancer: an update of Zahm and Ward's 1998 review. Journal of toxicology and environmental health. Part B, Critical reviews, 10(1-2), 81–99. https://doi.org/10.1080/10937400601034589
- Roberts, J. R., Dawley, E. H., & Reigart, J. R. (2019). Children's low-level pesticide exposure and associations with autism and ADHD: a review. Pediatric research, 85(2), 234–241. https://doi.org/10.1038/s41390-018-0200-z
- MCN Pesticide Hub- https://www.migrantclinician.org/explore-environmental-and-worker-health/pesticides.html