PESTICIDE POISONINGS. ARE YOU PREPARED?

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MIGRANT CLINICIANS NETWORK

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Disclosure and Disclaimer

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Disclosure: We have no real or perceived vested interests that relate to this presentation nor do we have any relationships with pharmaceutical companies, biomedical device manufacturers, and/or other corporations whose products or services are related to pertinent therapeutic areas.

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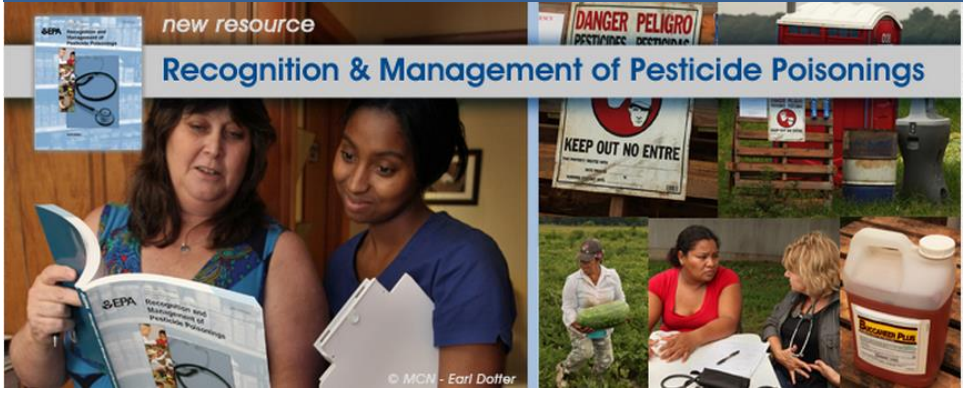
Learning Objectives

- Describe acute and chronic health effects of pesticide exposure
- Recognize multiple types and categories of pesticides
- Identify the clinical effects of active ingredients in commonly used pesticides
- Understand how to use the *Recognition and Management of Pesticide Poisonings, 6th ed*

Recognition and Management of Pesticide Poisonings, 6th Edition

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



Pesticide Exposure

- 10,000-20,000 occupational exposures per year in US (EPA 1996)
- Inconsistent and incomplete surveillance system
- Latinos 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)

If You Remember One Thing…

- **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.

Photo © earldotter.com

- ✓ 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

4 Month at Home

- 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 © earldotter.com

Understanding Pesticide Use
Survey of patients in 4 pediatric practices

- Insecticides are applied as a spray or powder in 66% of homes
  - 19% once a month
  - 14% two times a month or more often
- 12% said their doctor discussed pesticides
- Information sources for parents?
  - Pediatricians– 52%

Roberts JR Unpublished data

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
    - Not differences between kids and adults
    - A differential diagnosis of pesticides?
  - “Rat poison” equates checking for bleeding
    - No institutional memory of convulsants (strychnine)

Which of the following is not an insectide?

Commonly Presenting Signs and Symptoms

Seizures

Nausea, vomiting, diarrhea

Respiratory distress, pulmonary edema

Headaches and Mental status changes

- drowsiness
- lethargy
- coma

Skin findings

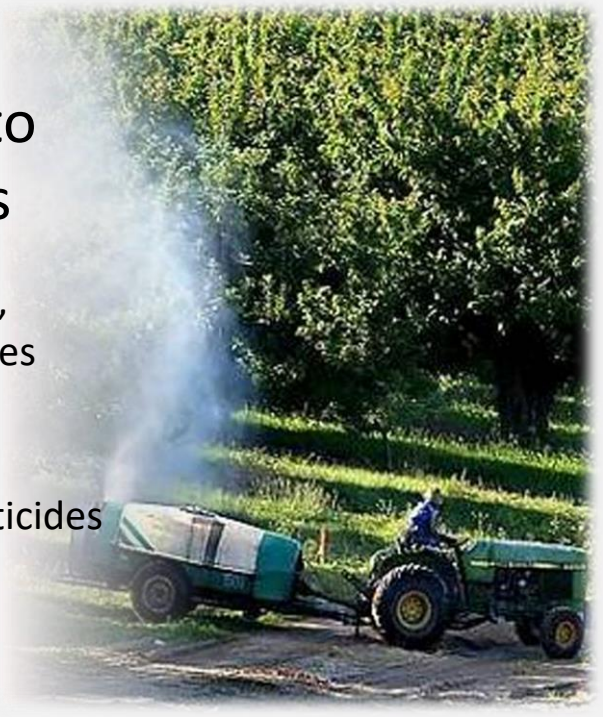
- rash
- blistering
- contact dermatitis

Cardiovascular

- tachycardia
- bradycardia
- hypotension

Worker Exposure to Pesticides

- Mixing, Handling, Applying Pesticides
- Working in Fields/Orchards Treated with Pesticides
- Drift



Exposure to Family Members

- ✓ "Take home" exposure
- ✓ Drift
- ✓ Home application of pesticides
- ✓ Lawn and vegetable and flower gardens

25 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 it another case of OP poisoning?

What signs or symptoms pointed you away from Organophosphates?

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

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Pyrethrins and Pyrethroids
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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

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 noninsecticidal 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

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 been raised.[7] … could result in hig… resistance of mammals …ng. However, the possi… …ed dosing in adults has …metabolize these agents …lting neurotoxicity.

Pyrethroids … clinical findings with overdosing. Ty… do not contain a cyano group, while … **fenvalerate**, always do.[10] Both of thes… amine relea… from the adrenals … …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 p… …e I.[10] Type I poisoning has been describe… hyperexcitability. Type II poisoning h… …and choreoathetosis. Other signs … facial sensation, dizziness, headache, fa… …ound and touch. In more severe … and … can develop. A large ingestion … …s 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

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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. [illegible] 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]

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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 1.[6] Sensations are described as stinging, burning, itching and tingling, progressing to numbness.[12,14,15] [illegible] 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)

- Introduced in US market in 1990s
- Used in agriculture and for flea control
- Modified from nicotine
- Displaces ACh
  - Selective binding to insect Ach receptors
  - Consequently, less human toxicity

Neonicotinoid Toxicity

- GI effects
  - Vomiting, sore throat, abdominal pain[1]
  - Ulceration throughout GI tract (solvent?)
- Excessive nicotinic receptor stimulation
  - Disorientation, agitation, weakness, LOC
- Severe poisoning
  - Rhabdomyolysis[2]
  - Tachycardia, progressed to v-tach, v-fib[3]

[1]Wu IW, et al. *J Toxicol Clin Toxicol.* 2001;39(6):617-621.
[2]Agarwal R, et al. *Am J Emerg Med.* Sep 2007;25(7):844-845.
[3]Huang NC, et al. *Am J Emerg Med.* Nov 2006;24(7):883-885.

Fipronil

- Introduced to the US market in the 1990s
- Agriculture, lawn treatments, roach bait stations, household pet application
- Inhibits GABA gated Cl^- channels
  - Hyperexcitability of the cell
- High affinity for insects compared to mammals
  - 128x more toxic to insects than mammals

Fipronil

- Majority of cases with mild clinical effects and/or short duration
- Nausea/vomiting, dizziness, headache, abdominal pain
- Altered mental status, agitation, LOC
- Seizures
  - Usually self limiting

Mohamed F et al. *J Toxicol Clin Toxicol.* 2004;42(7):955-963.
Lee SJ et al. Clin Toxicol 2010;48:737-744*
*Analysis of surveillance data from 2001-2007, 103 cases

Index of Signs and Symptoms

Starts on Page 244

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Gastrointestinal Tract and Liver

Liver

Kidney

SYSTEM: GI Tract and Liver, cont.

SYMPTOMS/ SIGNS/DISEASE CATEGORIES			
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

Signs and Symptoms

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Gastrointestinal Tract and Liver

Liver

Kidney

SYSTEM: GI Tract and Liver, cont.

SYMPTOMS/ SIGNS/DISEASE CATEGORIES			
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		

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

Which pesticide is most commonly reported to the Poison Control Center?

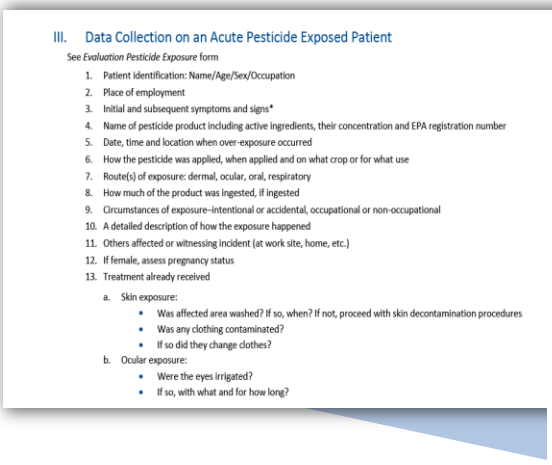
Report of Poison Control Centers' National Poison Data System

	Average 2001-2003			2014		
Pesticide	Total	Mod-Severe Morbidity	Death	Total	Mod-Severe Morbidity	Death
Pyrethroids	17,589	778	1	28,362	878	1
Organophosphates	9,501	567	8	2,921	159	3
Carbamates	3,750	167	1	1,661	73	1
Strychnine	134	17	1	66	9	1
Paraquat	77	12	3	90	8	1
Boric Acid	-	-	-	6,071	12	0

Mowery JR, Spyker DA, et al. *Clinical Toxicology* 2015; 53(10):962-1147

Data Collection of an Acutely Exposed Patient

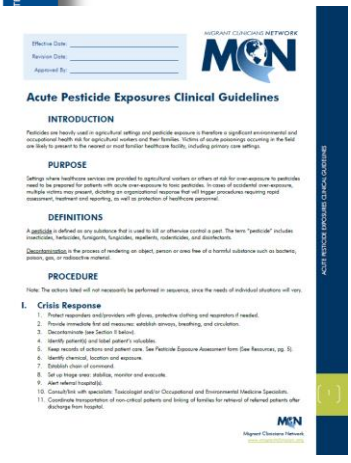
Acute Pesticide Exposures Clinical Guidelines



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?



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Acute Pesticide Exposures Clinical Guidelines

INTRODUCTION

PURPOSE

DEFINITIONS

PROCEDURE

I. Crisis Response

Data Collection on an Acute Pesticide Exposed Patient

Pesticide Label and/or Safety Data Sheet (SDS)

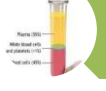
A fresh urine sample

Copy of pesticide application record

Any contaminated clothing

10 cc whole blood, anticoagulated with sodium heparin

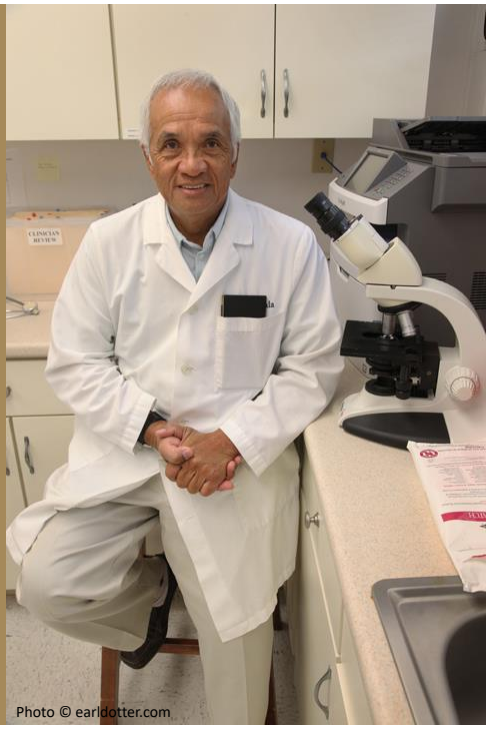
Other options



5 cc plasma anticoagulated with sodium heparin

Fingernail Residue | Saliva Sample | Hair Sample | Skin wipe

Are we done yet?



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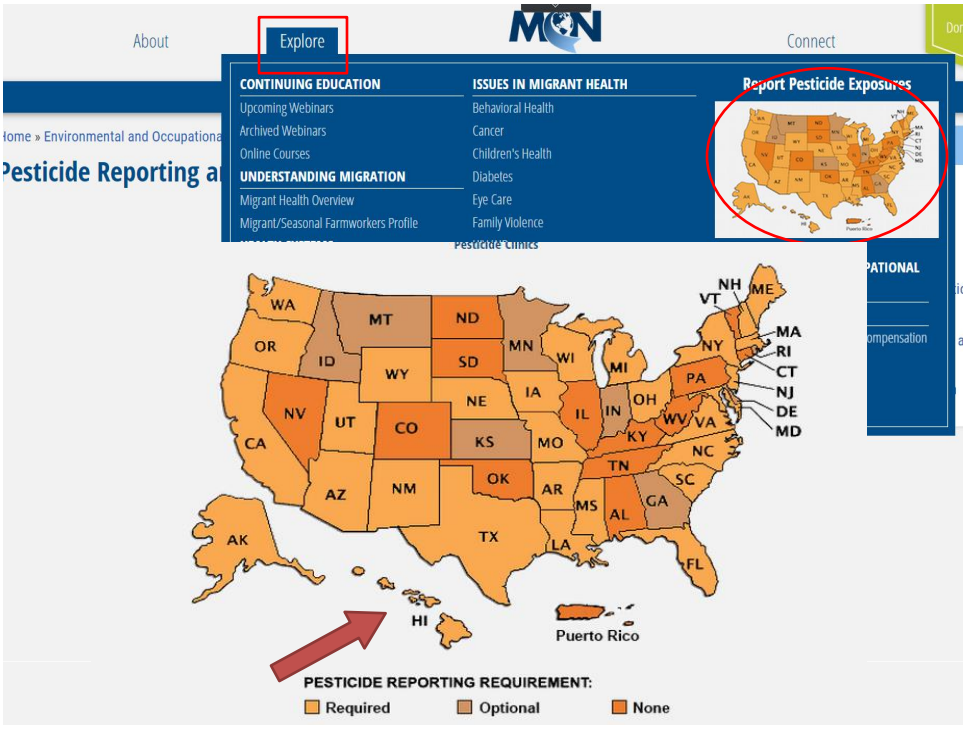
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Migrant/Seasonal Farmworkers Profile
ISSUES IN MIGRANT HEALTH
Behavioral Health
Cancer
Children's Health
Diabetes
Eye Care
Family Violence
Report Pesticide Exposures
Pesticide Clinics
WA
OR
CA
ID
NV
MT
WY
UT
AZ
CO
NM
ND
SD
NE
KS
OK
TX
MN
IA
MO
AR
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KY
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NJ
DE
MD
AK
HI
Puerto Rico
PESTICIDE REPORTING REQUIREMENT:
Required
Optional
None


Pesticide Reporting and Workers' Compensation Information for Hawaii
Close or Esc Ke
Report Exposure
Workers' Compensation
[edit] Report Exposure: Department of Health, Office of Hazard Evaluation and Emergency Response
Phone: 1-800-222-1222 (Hawaii Poison Control Center)
Report Online: http://eha-web.doh.hawaii.gov/eha-cma/Leaders/HEER/Pesticide-Illness-Reporting
Pesticide Reporting Requirements
Required to Report: Yes
What to Report?: Any Pesticide-Related Exposure
Timeframe to Report Injury or Exposure: 24 Hours
Who is Required to Report?: Physicians, Laboratories.
Additional Info:
For reporting purposes, pesticide and heavy metal poisoning include acute poisoning or any subacute illness caused by, or believed to be caused by, these toxic agents. Alternative Method: 1. Report by phone to the Hawaii Department of Health 1 (808) 586-4249 on O'ahu, or 1-800-468-4644 ext 64249 # from the Neighbor Islands.2. Fill out from from web site and mail to the Hawaii Department of Health.
WPS Enforcement
Worker Protection Standard Enforcement Agency:
Department of Agriculture: http://hawaii.gov/hdoa/pi/pest
Optional
None

Workers Compensation

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- Medical treatment for injured patient
  - Immediate
  - Long term
  - Access to Specialty Care
- Wages
- Return to Work
- Prevention - Hazard Control
- Public Health
  - Surveillance

When is illness or injury work related?

Any injury or illness resulting from or sustained in the course of any occupation or employment.

More than 50% likely due to work

USE THESE WORDS:

- "More likely than not" due to work
- Work "most likely" cause of the condition
- "But for the work" the condition would not exist

Biomonitoring Data from CDC

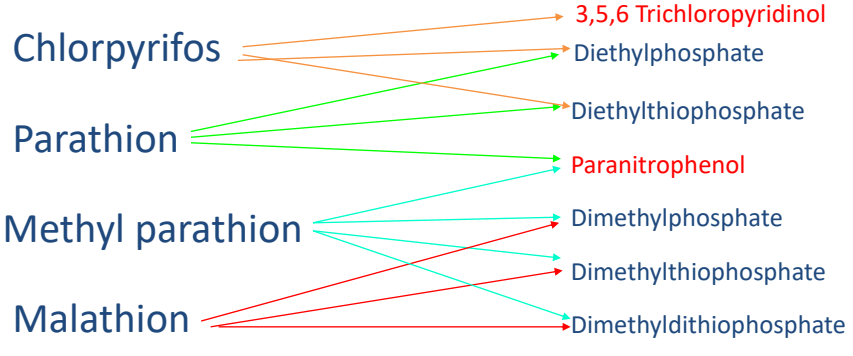
Urinary Pesticide Metabolites in Children

2001-2002 National Health and Nutrition Examination Survey (NHANES)

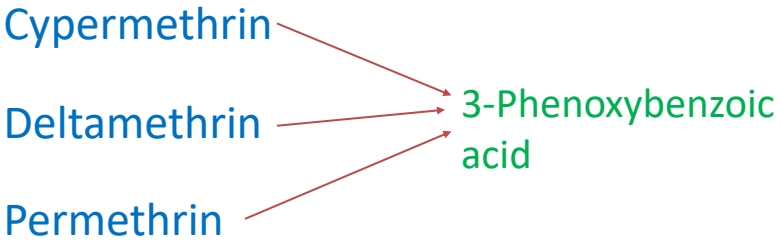
- Pesticide usage questions
  - Use of pesticide in the last month
  - Performed by professional or non-professional
- Dietary questions
  - Intake of types of foods (greens, dried beans)
- Lab data of urinary metabolites of OP and pyrethroid insecticides
  - Age for survey variables limited to 6 -18 years to maintain consistency with lab data

Organophosphate Metabolites

(Found in children's urine)



Pyrethroid Metabolites (Found in children's urine)



Conclusions

- Urinary metabolites of pesticides are higher when:
  - Pesticides have been applied in the past month
  - When applied by a non professional
  - Are applied more often
- Poverty and black race associated with higher organophosphate levels

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.

Adult Cancers

Hodgkins and NHL

- 23 of 27 studies with positive associations[1]
  - Half of studies in farm worker populations
  - Multiple classes of pesticides
- Separate meta-analysis case control studies[2]
  - NHL OR= 1.35, 95% CI, 1.2-1.5
  - Leukemia OR= 1.35, 95% CI, 0.9-1.2
  - Multiple myeloma OR= 1.16, 95% CI, 0.99-1.36

[1]Bassil KL, *Can Fam Physician.* Oct 2007;53(10):1704-1711
[2]Merhi M, *Cancer Causes Control.* Dec 2007;18(10):1209-1226

So what do we do?

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

- 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

Contact

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