Pesticide Toxicology

John P. Lamb, Pharm.D, CSPI
California Poison Control System
Sacramento Division at UCDMC
Sacramento Division
at UC Davis Medical Center
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Pesticide Toxicology

Total Call Volume, UCDMC

UCDMC  CPCS, Sacto

Sacramento Division
at UC Davis Medical Center
CA Poison Control System

- **Statewide Number:**
  - 1-800-876-4766
  - 1-800-8POISON

- **Nationwide Number:**
  - 1-800-222-1222
Sacramento Division at UC Davis Medical Center

AAPCC National Data, 2004
Total Exposures = 2,558,806

Routes of Exposure

- Oral 77%
- Dermal 7.5%
- Ocular 5%
- Inhalation 6%
- Bite/Sting 3.5%
- Other 1%

Sacramento Division
at UC Davis Medical Center
Routes of Exposure

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Top Non-Drug Poisonings

AAPCC National Data, 2004
1,096,356 out of 2,776,925 Exposures

- Cosmetics: 21%
- Foreign Bodies: 11%
- Pesticides: 9%
- Chemicals: 4%
- Hydrocarbons: 5%
- Food: 5%
- Alcohols: 7%
- Plants: 7%
- Envenomation: 9%
- Cleaners: 21%
- Food: 6%

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Pesticide Toxicology

Management Site, 2004

Human Exposures = 2,395,582

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Management Site

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Pesticide Exposures

AAPCC National Data, 2004
Total Exposures = 102,754

- Rodenticides: 19%
- Insecticides: 53%
- Fungicides: 1%
- Herbicides: 9%
- Fumigants: 1%
- Repellents: 17%

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Pesticide Exposure Outcomes

AAPCC National Data, 2004
Total Exposures = 102,754

No Effect
Minor
Moderate
Major
Death

Fungicides
Fumigants
Herbicides
Insecticides
Repellents
Rodenticides

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Insecticide Exposures

AAPCC National Data, 2004
Total Exposures = 53,978

- Metaldehyde: 0%
- Pyrethrin: 44%
- Combinations: 5%
- Carbamate: 5%
- Chlorinated HC: 2%
- Organo-phosphate: 22%
- Borates: 7%
- Arsenic: 1%
- Unknown: 7%
- Others: 18%

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Herbicide Exposures

AAPCC National Data, 2004
Total Exposures = 9723

- Glyphosate: 46%
- Chlorphenoxy: 23%
- Para-/Diquat: 3%
- Triazine: 5%
- Urea: 1%
- Carbamate: 0%
- Unknown: 4%
- Other: 16%

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Routes of Exposure

- Dermal
- Oral
- Inhalation
- Ocular
Routes of Exposure

“What the? ... This is lemonade! Where’s my culture of amoebic dysentery?”

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at UC Davis Medical Center
Insecticides

- Cholinesterase Inhibitors
  - Organophosphates
  - Carbamates

- Pyrethrins

- Chlorinated Hydrocarbons

- Methoprene
Organophosphates

❖ Mechanism:
   ◆ Phosphorylation of Acetylcholinesterase causes accumulation of Acetyl Choline.

❖ Muscarinic and Nicotinic Effects

❖ Examples:
   ◆ Parathion
   ◆ Dichlorvos (DDVP)
   ◆ Chlorpyrifos (Dursban)
   ◆ Malathion
Carbamates

- **Mechanism:**
  - Reversible carbamylation of Acetyl Cholinesterase allows accumulation of Acetyl Choline

- **Muscarnic and Nicotinic Effects**

- **Examples:**
  - Aldicarb
  - Propoxur (Baygon)
  - Carbaryl (Sevin)
Cholinesterase Inhibitors

Symptoms

- **SLUDGE**
  - Salivation
  - Lacrimation
  - Urination
  - Diarrhea
  - Gastric cramping
  - Emesis

- Bradycardia
- Pulmonary Edema
- Neurologic
Cholinesterase Inhibitors

Treatment

- Decontamination:
  - Protect Treating Personnel
  - Clothing/Leather
  - Triple Decontamination
  - Charcoal
- Atropine (for Muscarinic Effects)
- Pralidoxime (for Nicotinic Effects)
- Supportive Treatment
Primary vs. Secondary Contamination

- **Primary Contamination**
  - Reflects initial exposure to the compound
  - Dependant on route and vehicle
Primary vs. Secondary Contamination

- Secondary Contamination
  - Reflects the potential for the initial victim to contaminate others

- General risk of secondary contamination:
  - Liquids > Solids >> Gases
  - Lipid Soluble > Water Soluble
Sacramento Division

Associated Press

LODI — Seven emergency personnel and two other people were overcome by fumes from a high concentration of pesticide consumed by a man in an apparent suicide attempt Friday, authorities said.

The unidentified 35-year-old man who drank malathion was in critical condition, but the others were treated and released, said Lodi Memorial Hospital spokes-

woman Penny Jacobi.

The hospital’s emergency room was closed for decontamination for about four hours, said Jacobi. Incoming patients were diverted to another hospital in the city.

Two of the man’s family members were the first to be overcome. Six firefighters and paramedics were overcome when they arrived at the man’s home. A nurse was overcome when the man arrived at the hospital for treatment.
Secondary Contamination

- Darwin Awards 2004  Nominee No. 5: [Bloomberg News]:

- A terrible diet and a room with no ventilation are being blamed for the death of a man who was killed by his own gas emissions. There was no mark on his body, and an autopsy showed large amounts of methane gas in his system. His diet had consisted primarily of beans and cabbage (and a couple of other things). It was just the right combination of foods. It appears that the man died in his sleep from breathing the poisonous cloud that was hanging over his bed. Had he been outside or had his windows been opened, it wouldn't have been fatal. But the man was shut up in his nearly airtight bedroom. According to the article, "He was a big man with a huge capacity for creating "this deadly gas."

- Three of the rescuers got sick, and one was hospitalized.

Sacramento Division
at UC Davis Medical Center
Pyrethrins

- Derived from Chrysanthemums
- Low Mammalian Toxicity
- Paralyze Insect Nervous Systems
- Quick Knockdown
- Often Combined with Piperonyl Butoxide

Examples:
- Fenvalerate
- Permethrin
Pyrethrins Toxicity

- **Inhalation Exposure:**
  - Stuffy Nose, Scratchy Throat

- **Oral Exposure:**
  - Dizziness, Headache
  - Nausea, Vomitting
  - Fatigue, Weakness

- **Allergic Reactions:**
  - Wheezing, Bronchospasm
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at UC Davis Medical Center

Pyrethrins

Sherry Matthews/BAM!
Texas Poison Center Network
"Bug Bomb"

Spot # TDHP 0101B
:15 Stereo
03/19/95

3101 Bee Caves Rd. Ste. 300 Austin, Texas 78746
512-320-0070 Fax 512-320-1016

CALIFORNIA
POISON CONTROL
SYSTEM
Pyrethrins Treatment

- Decontamination
  - Wash
  - Lavage
  - Charcoal

- Supportive Treatment
  - Anaphylaxis
  - Seizures
Chlorinated Hydrocarbons

- Neurotoxic "Axon Poisons"
  - Examples:
    - Lindane
    - Chlordane
    - Kepone
    - DDT
  - U.S. E.P.A. Restrictions
    - DDT, Chlordane
Chlorinated Hydrocarbons Toxicity

- CNS Excitation
  - Tremor
  - Ataxia
  - Convulsions

- GI Symptoms

- Dermal Irritation
Chlorinated Hydrocarbons Treatment

- **Decontamination:**
  - Clothing/Leather
  - Wash
  - Lavage
  - Charcoal

- **Seizure Treatment**
Methoprene

- Insect Growth Regulator
- Very Low Toxicity to Non-Target Species
- No Eye or Skin Irritation
Hydramethylnon

- A slow acting insecticide which affects the immune system of insects.
- Products: Amdro, Combat, Maxforce
- No reports of human toxicity
- According to the manufacturer, a 20 kg dog would have to eat 250 trays of Combat Ant Killing System to have any adverse effects
N-Ethyl Perfluoroctane Sulfonamide

- **Products:**
  - Enforcer Ant Baits
  - Raid Ant Baits Plus, Raid Max Ant Bait
  - Ingredients include Peanut Butter 75-85%, Sugar 5-10%, and Sulfuramid 0.5%
  - Container size = 0.06 oz bait
- **LD50 for dog = 500 mg/Kg**
  - For 30 pound (13.6 Kg) dog, 1360 grams of bait =~2.83 pounds =~756 containers!
Thermagation

Well, at least they got rid of the bugs

ASSOCIATED PRESS

SANTA CRUZ – Charles Savoca was looking forward to ridding his house of termites, but he didn’t realize the whole house would be gone as well.

Exterminators on Monday accidentally blew up Savoca’s house while using “thermagation” – an alternative to fumigation – to get rid of termites and ants.

For whole-house thermagation, a tarp is draped around the home.

Propane heaters set up outside the house generate heat on the exterior walls and on the inside through portable duct systems. The temperature inside the house reaches 140 to 150 degrees, and the bugs are basically cooked to death.

It’s typically an effective way to rid a house of insects. But in Savoca’s case, something went wrong. First one propane tank blew up from the heat, and then four or five others followed.

It took five air tankers, three helicopters and dozens of firefighters two hours to control the blaze, which decimated Savoca’s home, leaving only a blackened concrete slab.

“I hired them thinking they had the expertise to do this without burning my house down,” Savoca said. “They sure exterminated my house.”
Herbicides

Guest Cartoon

BETTER
LIVING
THROUGH
CHEMISTR
Herbicides

- Chlorphenoxy Compounds
- Paraquat, Diquat
- Pentachlorophenol/Nitrophenols
- Carbamates
- Glyphosate
- Urea Substituted
Chlorophenoxy Compounds

- Several Hundred Products:
  - 2,4-D, 2,4,5-T
- Irritating to Skin, Eyes, Respiratory and GI Tracts
- Ingestion causes Emesis, Abdominal Pain, and Diarrhea
- Very Large Ingestion can cause Metabolic Acidosis
Paraquat and Diquat

- Highly toxic to lung, liver, heart, kidney, and adrenal glands.
- Paraquat can cause pulmonary fibrosis after 5 to 10 days.
- Diquat can cause cerebral lesions.
- Can be absorbed through abraded skin.
- Treatment:
  - Decontamination and Dialysis
Pentachlorophenols/Nitrophenols

- Irritating to skin, eyes, lungs.
- Toxic to liver, kidneys, and CNS.
- Cause pyrexia by increasing cell metabolism, and most severe exposures are in hot environments.

Treatment:
- Decontamination
- Lower fever
- Oxygen to decrease tissue anoxia
Lower Toxicity Herbicides

- **Carbamates**
  - Do not inhibit cholinesterase
  - Dermatitis, Stuffy nose, GI upset
  - "Antabuse" reaction with Alcohol

- **Glyphosate (Round Up)**
  - Mucous membrane irritation, GI pain,
  - Emesis, Hypotension, Anuria.
  - Can cause Esophageal or Gastric Erosion
  - Mean toxic dose = 104 ml concentrate
Lower Toxicity Herbicides

- Urea Substituted
  - Can cause GI upset
  - Can cause Methemoglobinemia
  - Examples:
    - Diuron
    - Fenuron
Animal Exposures

- 139,769 Animal Exposures Reported Nationally in 2004.

- Decontamination:
  - Protect Person Washing Animal
  - Hydrogen Peroxide Used as Emetic

- Antidote Dosing
Cockroach Slain, Husband Badly Hurt

Tel Aviv

An Israeli housewife's fight with a stubborn cockroach put her husband in the hospital with burns, a broken pelvis and broken ribs, the Jerusalem Post newspaper reported yesterday.

The wife, frightened by the insect when she found it in their living room, stepped on it, threw it in a toilet and sprayed a full can of insecticide on it when it refused to die.

Her husband came home from work, went to the toilet and lit a cigarette. When he threw the cigarette butt into the bowl, the insecticide fumes ignited, "seriously burning his sensitive parts," the Post wrote.

When paramedics were called to the home in Tel Aviv, they laughed so hard when they learned what had happened that they dropped the stretcher down the stairs, breaking the unidentified man's pelvis and ribs.
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