Objectives

• Distinguish between pesticide exposure & pesticide injury/poisoning
• Avoid the potential for pesticide exposure & injury
• Recognize the types of pesticide exposure & the possible effects: allergic, acute & delayed
• Know how to respond to pesticide poisoning
• Accurately report history & symptoms to clinicians
• Learn about pesticide spill management
• Learn where to dispose of pesticide spill material, unwanted and outdated pesticides
• Chemicals developed to kill or control some life form

• Commonly kill or control insects, weeds, fungi or rodents

• Widely used on agricultural crops, in the home, in yards, in public places & for mosquito control

• Commonly called insecticides, herbicides, fungicides, miticides & rodenticides

• Benefits include increased crop production, preserving produce, combating pest infestations & controlling exotic species
• Occur when you come in contact with a pesticide & it enters the body through ingestion, inhalation, or contact with the skin, eyes, or mucus membranes

• They must contact your body to harm you

• When not used, stored, disposed of properly, pesticides can cause harm to humans, animals, non-target organisms & the environment
Severity depends on the toxicity of the chemical ingredients, the amount, the length of time & how it enters the body.

Hazard = Toxicity X Exposure
TOXICITY

LD$_{50}$: dose that is acutely lethal to 50% of the test population of animals
Potential for Pesticide Injury

- **Toxicity** - the potential for a chemical to cause harm
- **Dose** - the quantity of the chemical exposed to; varies with weight & age of person; amount that is harmless to an adult may be toxic to a child
- **Route or Absorption** - the way the body come in contact with the chemical; most common is through the skin
- **Duration of Exposure** - the longer exposed, the more chemical enters the body
- **Physical & Chemical Properties** - qualities affect risk: evaporate more readily more easily inhaled, break down quicker reduces exposure risk
Potential for Pesticide Injury

Population at Risk

- Greatest danger of pesticide illness are those exposed the most, such as workers who mix & apply pesticides
- Some people are more sensitive
- Responses can be different depending on health condition, age, individual characteristics
- DACS, Bureau of Entomology & Pest Control Registry for Pesticide Sensitive Individuals
Potential for Pesticide Injury

- Personal Protective Equipment (PPE) not available or not worn
- Lack of experience with acutely toxic chemicals
- Lack of supervision or hazard training
- Label not protective enough
Pesticide sprayed from an airplane, tractor, truck mounted, compressed air or backpack sprayer may drift or blow onto people or non-target sites.
Types of Exposure

Occupational

- Farm workers, applicators or mixers come into contact with high concentrations & large volumes of pesticides
- Risky activities include - applying, mixing, weeding & hand harvesting crops
- Workers unknowingly expose families by carrying pesticides into homes on their bodies, clothes, shoes or by washing work clothes together with family laundry
Pesticide Poisoning

• An illness or injury resulting from exposure to a single or mixture of pesticides from a single or multiple exposures

• Any substance can be harmful if exposed to too much of it - Death by water?

• Accidents or misuse can cause illness, injury or death
Types of Exposure
Household

- Improper use, storage & application of household pesticides
- Insect repellents, foggers, baits, rodent poisons, weed killers, flea & tick control & disinfectants
- Residues from commercially applied products
PESTICIDES DON'T STAY PUT!

Pick Your Poison...Wisely!

Use pesticides responsibly.
Choose NON-CHEMICAL methods & LEAST TOXIC products. Why?
Runoff from around your home and garden carries water containing
pesticides that pollute our streams, rivers, lakes & oceans.

Visit ThinkBlueSD.org & ProjectCleanWater.org on the web to learn
more about San Diego regional water quality. For PEST information,
visit the University of California website: www.IPM.ucdavis.edu or call
the UCCE Master Gardeners: (858) 694-2860 Mon-Fri 9 am to 3 pm.
Common Pesticide Poisonings

<table>
<thead>
<tr>
<th>Rank</th>
<th>Pesticide or Class</th>
<th>Total</th>
<th>Tx</th>
<th>Death</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pyrethroids</td>
<td>53,263</td>
<td>952</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Anticoagulant Rodenticides</td>
<td>15,334</td>
<td>4,576</td>
<td>1</td>
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<tr>
<td>3</td>
<td>Insect Repellents</td>
<td>12,332</td>
<td>3,094</td>
<td>0</td>
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<tr>
<td>4</td>
<td>Organophosphates</td>
<td>5,484</td>
<td>1,525</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Pyrethrins</td>
<td>5,076</td>
<td>947</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>Glyphosate</td>
<td>4,146</td>
<td>788</td>
<td>1</td>
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<tr>
<td>7</td>
<td>Carbamates</td>
<td>2,768</td>
<td>604</td>
<td>0</td>
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<tr>
<td>8</td>
<td>Chlorophenoxy</td>
<td>2,214</td>
<td>453</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Fertilizers</td>
<td>2,697</td>
<td>71</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Hypochlorite Disinfectants</td>
<td>16,869</td>
<td>10,751</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td><strong>Total Pesticide/Class</strong></td>
<td><strong>100,617</strong></td>
<td><strong>12,939</strong></td>
<td><strong>8</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total All insecticides/disinfectants/fertilizers</strong></td>
<td><strong>120,183</strong></td>
<td><strong>23,761</strong></td>
<td><strong>8</strong></td>
</tr>
</tbody>
</table>

American Association of Poison Control Centers, Toxic Exposure Surveillance System, 2004 data. Based on unintentional reported exposures for all ages.

- Shows only cases reported to Poison Control Centers
- Gives a sense of relative frequency of exposure from agent or class
- Generally reflects how widely the product is used
- Occupational exposures are not well covered
Effects of Pesticide Exposure

Generally fall into three categories:

- Allergic
- Acute
- Delayed
Some people develop a reaction after being exposed to a certain pesticide

• Includes asthma & skin, eye & nose irritation

• An exposure causing an allergic reaction can be 1,000 times less than an exposure that may cause a toxic reaction - *a trivial dose can trigger an attack*

• In many cases the highly refined active ingredient is not the culprit; the inert ingredients may contain petroleum distillates, emulsifiers, conditioning agents or wetting agents

• Sensitization- when the reaction occurs after many exposures
Acute

• Appear immediately or within 24 hours of exposure
• More accurately diagnosed than delayed because they tend to be more obvious
• Often reversible if appropriate medical care received promptly
• May be fatal if not treated
Acute

Classified according to site of exposure

ORAL

DERMAL

INHALATION

EYE
Developmental & reproductive- occur to the fetus in the womb or to the reproductive system:

- Birth defects, miscarriage, stillbirth, infertility, sterility, impotence
- ADHD, delayed motor speeds & coordination
- Can span generations
Systemic- illness or injury that does not appear within 24 hours of exposure:

- Anemia, inability to coagulate, paralysis, tremor, brain damage, skin disorders, lung & respiratory disorders, liver & kidney disorders

- Researchers at the Harvard School of Public Health (HSPH) have shown that individuals reporting chronic, low-dose exposure to pesticides had a 70% higher incidence of Parkinson’s Disease than those not reporting exposure (Science Daily, June 26, 2006)

- Men with specific gene variants who had been exposed to organochlorine insecticides had a 350% greater chance of developing the disease (Archives of Neurology, June 2010)
Delayed & Chronic

Chronic- illnesses or injuries that persist over long periods of time & may not appear until several years after exposure

- Carcinogenesis, Tumors, malignancies, cancer, changes in genes & chromosomes
Treating Acute Pesticide Poisoning

- Specific recommendations vary among the type of pesticide
- For specific information, refer to the pesticide label or call the Poison Control Center
- In an emergency, always take the label with you to the emergency facility
How Pesticides Enter Body

- Orally
- Ocular
- Dermal – most common, 97%
- Respiratory
DERMAL - Percent Dose Absorbed by Body Area

<table>
<thead>
<tr>
<th>Body Area</th>
<th>Percent Absorbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdomen</td>
<td>18%</td>
</tr>
<tr>
<td>Armpit</td>
<td>64%</td>
</tr>
<tr>
<td>Ball of Foot</td>
<td>13%</td>
</tr>
<tr>
<td>Back of Hand</td>
<td>21%</td>
</tr>
<tr>
<td>Ear canal</td>
<td>40%</td>
</tr>
<tr>
<td>Forearm</td>
<td>9%</td>
</tr>
<tr>
<td>Forehead</td>
<td>36%</td>
</tr>
<tr>
<td>Genital area</td>
<td>100%</td>
</tr>
<tr>
<td>Palm</td>
<td>12%</td>
</tr>
<tr>
<td>Scalp</td>
<td>32%</td>
</tr>
</tbody>
</table>
Skin Decontamination

Hands & forearms account for majority of skin exposures usually resulting from splashing or spilling during mixing

- Remove all contaminated clothing
- Wash exposed area with generous amounts of soap & water
- Shower if much of body exposed & use shampoo on hair & scalp
- Wash under fingernails & in skin folds
- Attendants- avoid contact with clothing & wear chemical resistant gloves
Chemical Burns on Skin

- Remove contaminated clothing
- Wash skin with large quantities of cold running water
- Avoid using ointments, greases, powders & other drugs
Respiratory Exposure

- Move the victim to fresh air immediately
- Ensure a clear airway exists
- If convulsing, watch breathing & protect from falls & blows to head
- Pull victim’s chin forward so tongue does not block air passage
- If breathing stopped, administer artificial respiration until hospital reached
Eye Exposure

- Some pesticides cause damage on contact
- Wash the eye as quickly & gently as possible
- Wash for 15 minutes or more with clean gentle stream of body temperature water
- Do not use chemicals or drugs in wash water
Swallowed Pesticide

Seek immediate medical attention

- If pesticide still in mouth, wash it out with lots of water
- Quickly & carefully read the first aid section of the pesticide label or contact the Poison Control Center to see if the swallowed pesticide should be diluted
- Some pesticides should NEVER be diluted - this will be on the label or available at the Poison Control Center
Swallowed Pesticide

Check to see if vomiting should be induced, if so...

- Move the victim to a kneeling position to prevent choking
- Use syrup of ipecac or put finger in victim’s mouth & touch back of throat - do not use salt water or give liquids to induce vomiting

Do not induce vomiting if the victim:

- Is unconscious or convulsing
- Swallowed a corrosive poison or emulsifiable concentrate
Swallowed Pesticide

Keep victim calm, contact emergency service or take victim to nearest medical facility

Have available any product label & MSDS
What do Clinicians Face?

Patients may present with complaints of:

• Nausea, vomiting, headache, weakness, diarrhea, stomach cramps, dizziness, confusion, blurred vision

• Excessive sweating, chills, thirst

• Chest pain, difficulty breathing, muscle or body cramps or twitching
Many clinicians don’t know how or have little experience diagnosing pesticide illness or poisonings

- The patient may not relate the illness to pesticide exposure
- The patient may be reluctant to report the truth
We don’t know what over exposure looks like

In most cases data comes from ingestions in children or suicides

These are extreme modes

• Dosages are very high
• Children are different
• Suicidal patients are not workers
Pesticide illness/poisoning presents differently in children

- Seizure vs.

- Pesticide Poisoning
No easily accessible test for most pesticides
Limited diagnostic tools for clinicians

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Diagnostic Tools</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viral Illness</td>
<td>Antigen Tests</td>
<td>Excellent</td>
</tr>
<tr>
<td>Food Poisoning</td>
<td>History Only</td>
<td>Poor</td>
</tr>
<tr>
<td>Hangover</td>
<td>History &amp; Physical Exam</td>
<td>Good</td>
</tr>
<tr>
<td>Heat Exhaustion</td>
<td>History &amp; Physical Exam</td>
<td>Good</td>
</tr>
<tr>
<td>Medication Rx</td>
<td>History Only</td>
<td>Average</td>
</tr>
<tr>
<td>Malaria</td>
<td>Blood Smear</td>
<td>Excellent</td>
</tr>
<tr>
<td><strong>Pesticide Poisoning</strong></td>
<td>History Only</td>
<td>Poor</td>
</tr>
<tr>
<td>Green Tobacco Illness</td>
<td>History &amp; Conitine</td>
<td>Excellent</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>Exam &amp; Urine/Blood Test</td>
<td>Excellent</td>
</tr>
</tbody>
</table>
So...how are pesticide exposures treated?

In most cases with decontamination & symptomatic therapy

Antidotes exist only for:

- Cholinesterase inhibitors: Atropine & 2-PAM
- Rodenticides: Fresh frozen plasma & Vitamin K
- Cyanide containing pesticides: Sodium nitrite and sodium thiosulfate
- Some herbicides: Alkaline diuretics
- Some are not treated - You want to know which not to treat
Diagnostic/Clinical Resource

Available through US EPA

or

US Government Printing Office
Personal Protective Equipment

Clothing and devices worn to protect your body from contact with pesticides or residues

• The pesticide label lists the *minimum* you must wear while handling the pesticide

• You are required by law to follow all PPE instructions on the pesticide label
Personal Protective Equipment

All PPE should be either disposable or easy to clean & sturdy enough for repeated use

PPE must be maintained carefully & replaced as necessary
Personal Protective Equipment

Not all PPE will protect you from all chemicals

• Type of solvent in the chemical determines what type of PPE is resistant
• Rubber gloves will only protect you from water-based or dry pesticides
Personal Protective Equipment
Disposable PPE

- Are not designed to be cleaned & reused
- Discard them when contaminated
Disposable PPE

Chemical-resistant gloves, footwear & aprons

- Designed to be worn for a limited time & thrown away
- Often made of thin vinyl, latex, polyethylene
- May be a good choice for brief tasks that required flexibility & that will not tear the thin material
Disposable PPE

Non-woven (including coated non-woven) coveralls & hoods

• Most intended to be worn for only one workday exposure period

• Some may be worn more than once if the exposure period is short & little contamination

• Change if pesticides getting through material or inside contaminated
Disposable PPE

Pre-filters, canisters, cartridges & some respirators

• Disposables cannot be cleaned & reused
Reusable PPE

- Some are designed to be cleaned & reused
- Do not reuse items that can no longer provide protection
Reusable PPE

Rubber & plastic suits, gloves, boots, aprons & headgear

• Replace often
• Wash thoroughly between uses
• Inspect for signs of wear or abrasion
• Tiny holes or thin areas allow pesticides to move to the inside surface
Reusable PPE

Rule of thumb - hand protection is most important concern - most exposure

- Dispose of gloves after one week of work
- Extra-heavy-duty may last 2 weeks (butyl, nitrile rubber)
- Footwear, aprons, headgear & suits may last longer
Reusable PPE

Fabric coveralls

- Designed to be cleaned after each day’s use
- Absorbent materials: cotton blends, denim, canvas - cannot be adequately cleaned if thoroughly drenched or contaminated with signal word “DANGER” or “WARNING” - discard
Reusable PPE

Eyewear & Respirators

• Most designed to be cleaned & reused
• May last many years if good quality & maintained correctly
Reusable PPE

Air Purifying Respirators

• OSHA requires a fit test be performed every time a person puts on a respirator
• They should always be NIOSH approved
• If no instructions are provided, the cartridges should be changed at the end of the workday
An accidental release of a pesticide

- May be minor
  - ✓ A dribble from a container
- May be major
  - ✓ Involving large amounts of a pesticide
  - ✓ Involving pesticide containing materials such as wash water, soil, or absorbents
Pesticide Spills

The faster you can contain, absorb and dispose of a spill, the less chance it will cause harm.

Clean up immediately.

Even minor dribbles or spills should be cleaned up before the end of the day to prevent workers or animals from being exposed.
The requirement to report a chemical spill is based on the potential for harm to \textit{human health} or the \textit{environment} from the spill. Therefore, it is impossible to give simple guidance.
Who Can Help You Decide On Reporting A Spill

National Response Center
1-800-424-8802
1-202-267-2675

CHEMTREC
Maintains a large database of MSDS, chemical information reference sources, and networks of chemical and hazardous material experts
1-800-424-9300
Who Can Help You Decide On Reporting A Spill

• For small spills – call the pesticide manufacturer or the National Pesticide Information Center (NPIC)
  1-800-858-7378

• On a public road
  ✓ Call the police for traffic control
  ✓ Call CHEMTRAC for how to handle it
  ✓ Call FDACS Pesticide Compliance Program at 1-850-617-7850
Other Reporting

You may need to report spills in excess of certain amounts of active ingredient to the State Warning Point.

Florida Division of Emergency Management

1-850-413-9911
Steps to Clean Up

1. Protect Yourself

Put on appropriate personal protective equipment

LABEL – you should already know, check the MSDS
Steps to Clean Up

2. Control
Stop the source
• Stop the inflow
• Put leaking container into a larger chemical resistant container

Protect Others
Stay at the Site
Steps to Clean Up

3. Contain the Spill

- Use isolation snakes, soil, kitty litter, to surround spill
- Use tools to make a dike
- Protect pathways to water bodies; block or redirect drains
3. Contain the Spill
Absorb liquids with absorbent material – sand, kitty litter
Prevent dry material from becoming airborne by covering with a tarp, sweeping compound or lightly misting with water
Steps to Clean Up

4. Clean Up

Starting closest to water sources/water bodies

Sweep it up  Soak it up

Moving away from water bodies
4. Clean Up

Transfer contents to transportation bag/container
Check MSDS on how to decontaminate site
i.e.: Use a detergent – use soap & water, work it into the spill site, use absorbent material to soak up residue, sweep it up, transfer to labeled bucket

Do not allow wash material to run off into water bodies or drains
- Clean the clean up tools
- Clean, wash or dispose of PPE
- Clean yourself
- Dispose of spill and decontamination materials
Disposing of Pesticides

Clean Sweep – no longer funded in Florida

Dispose of through a licensed hazardous waste transporter

Southern Waste Information Exchange
Disposing of Pesticides

Hillsborough County has a contract with EQ Florida

Farmers & pest control companies can avail of the same rate the county pays; need to mention the Hillsborough Environmental Protection Commission (EPC) or Hillsborough County

EQ Florida
7202 East Eight Ave. 1-813-623-5302
Tampa, FL 33619 www.eqonline.com
Disposing of Pesticides

Southern Waste Information eXchange (SWIX)

- Hazardous waste match maker
- Waste generators matched with waste users
- Non-profit
- Objective to recycle and reuse solid and hazardous waste; sort of like Craig’s List
- Partner – FDEP
- 1-800-441-7949 www.swix.com
So What?

- Principle of exposure
- Difficulty in diagnosing exposure related illness
- How to protect yourself
- How to clean up a spill
- Where to dispose of unneeded pesticides
Scalp 32%
Ear Canal 40%
Abdomen 18%
Genital Area 100%
Ball of Foot 13%
Forehead 36%
Armpit 64%
Forearm 9%
Palm 12%
Back of Hand 21%
Thank you

Susan Haddock
Commercial Horticulture
IPM
Small Farms Agent

UF/IFAS Hillsborough County Extension

(813)744-5519

szcrmchz@ufl.edu