

2014 Tri River Area
Pest Management Workshop
304 Residential & Commercial II

Pesticide Chemistry
SOME UNANSWERED QUESTIONS

AND CHALLENGES!

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Pesticide Applicator Training

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**Commercial Pest Control Industry:
Safety and Reliability**

Safety is the primary consideration when using pesticides in and around the home and workplace. Commercial pest management professionals are looking for products that

- provide consistent performance: good control, no customer complaints.
- do not restrict their customers: no re-entry restrictions or risk to children, pets, non-target organisms, neighbors, etc.
- can be applied safely and easily.
- can control a broad range of pests, thus reducing the number of products needed on a service truck.

PESTICIDE CHEMISTRY

- There are no less than 30 major classes of chemicals that make up pesticide chemicals.
- Many of these are further broken down into subclasses.
- We will concern ourselves with only those which we find use for in the urban environment.
- Furthermore, we will only discuss **the modes of action** which those pesticides exhibit.

PESTICIDE CHEMISTRY

--Much is often said about switching pesticides as a means of avoiding problems generated by acquired resistance.

--There are a number of ways to classify pesticides.

Chemical class; target pest; point of attack, mode of action.

Most insecticides affect one of five biological systems in insects.

--How an insecticide works is called its **MODE OF ACTION.**

HOW DO THEY WORK?

•OR

•WHAT IS THEIR MODE OF ACTION?

PESTICIDE CHEMISTRY

MODES OF ACTION

- Insecticides that affect the nervous system.
- Insecticides that inhibit energy production.
- Insecticides that affect the endocrine system.
- Insecticides that inhibit cuticle production.
- Insecticides that affect water balance.
- Insect that affect respiration.

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MODES OF ACTION

THOSE THAT AFFECT THE NERVOUS SYSTEM

1. **Axonic poisons** that affect the nerve fibers, resulting in continuous nerve stimulation.
Pyrethrins, pyrethroids, phenylpyrazoles, cyclodienes and avermectins.
2. **Synaptic poisons** that affect the nerve junctions (synapses) and also result in continuous nerve stimulation.
Carbamates, organophosphates and chloronicotynyls.

THOSE THAT AFFECT THE NERVOUS SYSTEM

- **Axonic poisons** that affect the nerve fibers
 - **Botanicals** -- d-limonene, like **Mother Earth Wasp and Hornet Killer**, the various pyrethrins, nicotine and rotenone
 - **The many synthetic pyrethroids**, such as **Tempo, Suspend, Talstar, DeltaDust, CyKick CS, Zenprox and Cyhalothrin**
 - **The avermectins**, such as **Avert™ and Advance**
 - **Phenylpyrazoles** -- **Combat, FrontLine, Maxforce FC Magnum, Termidor**
 - **Cyclodienes** -- (chlordane, aldrin, heptachlor, etc.)

THOSE THAT AFFECT THE NERVOUS SYSTEM

- **Synaptic poisons** that affect the nerve junctions (synapses)
 - **Nicotinoids** -- imidacloprid (**Premise**), dinotefuran (**Advance Cockroach Bait**), **Alpine**
 - **Organophosphorous compounds** – fenthion (Baytex), malathion, parathion, diazinon, chlorpyrifos (Dursban), acephate (**Orthene**),
Note history!!
 - **Carbamates** – Propoxur (Baygon), bendiocarb (Ficam)
 - **Indoxacarb** – **Advion Ant Gel**

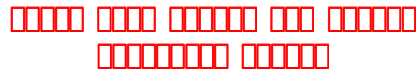
THOSE THAT AFFECT THE NERVOUS SYSTEM

- There are other nerve poisons which cause:
 - Cessation of feeding or grasping.
 - Inhibition of cuticle production.
(See later)

Those that inhibit energy production

They just simply run out of gas

- Pyrrrole insecticides – chlorfenapyr (**Phantom** termiticide)
- Hydramethylnon – **Amdro, Maxforce** granular ant bait
- Sulfuryl fluoride – **Vikane** fumigant
- Sulfuramid -- **Raid Max, First-Line**



Juvenile hormone analogs – Also known as insect growth regulators (IGRs). **These do not allow the immatures to become reproductive adults.**

- Hydroprene – **Gencor**
- Methoprene – **Pharorid, Precor**
- Fenoxycarb – **Logic**
- Pyriproxyfen – **Archer, Flea Fix, Nylar**
- Kinoprene

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Those That Inhibit Cuticle Production

- Chitin (exoskeleton) synthesis inhibitors
 - They cannot molt successfully from one stage to the next.
- Diflubenzuron – **Dimilin** (used for mosquito larva control)
Advance Termite Bait Blocks
- Hexaflumuron – The original **Sentricon** product.
Noviflumuron – **Recruit IV** (The current **Sentricon** product)
- Lufenuron – **Program** (systemic flea control)

INORGANIC
(Dessicant)

- Point of Attack -- Exoskeleton (cuticle)
- Type of Attack – 1.) Tie up lipids.
2.) Scarify exoskeleton.
- Effect of Attack -- Dehydration, dessication.

Those That Affect Water Balance
(Dessication)

- Absorb the oils in the exoskeleton
- Diatomaceous earth – Many trade names
 - Salt water forms
 - Two forms
 - Fresh water forms
 - Silica gels and dusts – Many trade names
- Exact point of attack is unknown
- Boric acid – Many trade names*
- *Also acts as a stomach poison

INORGANIC
(Dessicant)

- Examples of products will include:
 - **Roach Prufe**
 - **Dri-Die**
 - **Shell Shock**

MECHANICAL EFFECT

- Clog the pores with oil
- Old-fashioned mosquito control fogging
- Some indoor fogging

Repellents and Attractants
and Other Behavior Modifiers

- Repellents – Such as **DEET** & citronella oil
- Attractants – Such as those used in **Invict**
- Pheromones (Too many to mention)

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Minimum Risk Pesticides
25b Active Ingredients

Castor oil (U.S.P. or equivalent)*	Linseed oil
Cedar oil	Malic acid
Cinnamon and cinnamon oil*	Mint and mint oil
Citric acid*	Peppermint and peppermint oil*
Citronella and Citronella oil	2-Phenethyl propionate (2-phenylethyl propionate)
Cloves and clove oil*	Potassium sorbate*
Corn gluten meal*	Putrescent whole egg solids
Corn oil*	Rosemary and rosemary oil*
Cottonseed oil*	Sesame (includes ground sesame plant) and sesame oil*
Dried Blood	Sodium chloride (common salt) *
Eugenol	Sodium lauryl sulfate
Garlic and garlic oil*	Soybean oil
Geraniol*	Thyme and thyme oil*
Geranium oil	White pepper
Lauryl sulfate	Zinc metal strips (consisting solely of zinc metal and impurities)
Lemongrass oil	

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- can control a broad range of pests, thus reducing the number of products needed on a service truck.

Are there any other questions which we must answer than those pertaining to the chemical action or toxicity upon living organisms?



**If what happens in Vegas, stays in Vegas,
does**

What happens in California, stay in California?

ARE YOU THINKING GREEN?

What is "Green"?

Living pesticide-free?

Practicing IPM?

What's the difference?

- Going **green** is a popular term used to describe the process of changing one's lifestyle for the safety and benefit of the environment.

"I don't use pesticides"

"I won't allow pesticides"

"I only use organic pesticides"

"I only use natural pesticides"

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THE DIFFERENCE IS ---

IPM *always includes the option* to use pesticides,
when their use does not present significant non-target
exposure risks!

Three Considerations

- Organic food production, processing and storage
- The San Francisco Reduced-Risk Pesticide List
- Leadership in Energy and Environmental Design (LEED)

ORGANIC FOOD PRODUCTION, PROCESSING AND STORAGE

- USDA -- National Organic Program
Provides a "least-toxic" pesticide list
- Organic Materials Review Institute (OMRI)
501(c)3 non-profit organization
A. Provides organic certifiers, growers and processors
an independent review of suitable pesticides.
B. Classifies pesticides as:
Allowed, Allowed w/restrictions, Prohibited
- Bio-Integral Resource Center
Also provides a "least-toxic" pesticide list

SAN FRANCISCO REDUCED-RISK PESTICIDE LIST

This public document categorizes pesticides in 3 tiers

- Tier I – Most Hazardous
- Tier II – More Hazardous
- Tier III – Least Hazardous

This document was designed for
San Francisco city-owned properties
But:

It is being widely adopted across the country!

LEED

LEADERSHIP IN ENERGY & ENVIRONMENTAL DESIGN

Is a program that provides third-party verification of "green"
buildings from:

DESIGN
CONSTRUCTION
OPERATION
MAINTENANCE

LEED

- The pest management industry can provide input here, at
least in the operation and maintenance

We must step up to the plate on this!

**Without our input, there is no telling
what might happen!**

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