Integrated Mosquito Management

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Topics of discussion:

- Integrated pest management (IPM)
  - History of pest management
  - Definition of IPM
- What is Integrated Mosquito Management (IMM)?
  - Some history
  - Why IMM is important

What is a pest?

Anything that:

- Competes with humans, domestic animals, or desirable plants for food or water
- Injures humans, animals, desirable plants, structures or possessions
- Spreads disease to humans, domestic animals, wildlife or desirable plants
- Annoys humans or domestic animals

A Brief History of Pest Control:

The first farmers likely did not so much "control" as allow for pests - that is, they planted enough for themselves and the pests (deer, rabbits, insects, etc)

Records of natural pest control date back to 2500 BC, thousands of years after the beginning of agriculture.

2500 BC: Ancient Sumerians used sulfur compounds to kill insects - earliest record of insect pest control

1500 BC: First descriptions of cultural controls especially the manipulation of planting dates

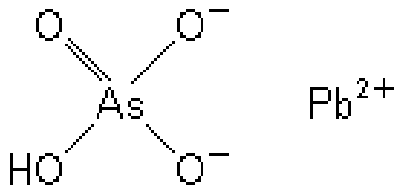
1200 BC: Botanical insecticides were being used for seed treatments and as fungicides in China. The Chinese were also using mercury and arsenical compounds to control body lice.

A Brief History of Pest Control (cont):


H-1

1860 - First use of arsenical insecticide noted; use of Paris green mixed with flour as insecticide for Colorado potato beetle control.

1894 - First "spray calendar" invented.



lead arsenate

http://entweb.clemson.edu/pesticid/100years/100yrH.htm

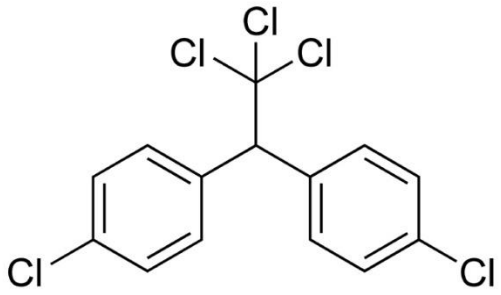
A Brief History of Pest Control (cont):

1910: Federal Insecticide Act (FIFRA: An Act for preventing the manufacture, sale, or transportation of adulterated or misbranded Paris greens, lead arsenates, and other insecticides, and also fungicides, and for regulating traffic therein and for other purposes.)

http://www2.epa.gov/pesticides

A Brief History of Pest Control (cont):

1939: Recognition of insecticidal properties of DDT



DDT was far less poisonous than the pre-WWII arsenic compounds.

The phenomenal results with DDT stimulated industry to look for related types of chemicals.

By the late 1940's, there were several other encouraging insecticides available.

Time magazine ad for DDT

BETTER LIVING THROUGH CHEMISTRY: The World Health Organization estimates that during the period DDT was used, approximately 25 million lives were saved.

A Brief History of Pest Control (cont):

1947: First documented case of pesticide resistance (common house fly resistant to DDT)

1950's-60's: Widespread development of resistance to DDT and other pesticides.

By 1972, DDT was banned from the United States due to widespread development of resistance to DDT and evidence that DDT use was possibly increasing preterm births and also harming the environment.

TROUBLE IN PARADISE

A Brief History of Pest Control (cont):

The chemical industry responded to the concern over DDT and its relatives with new classes of pesticides, which are less persistent than DDT and the other organochlorines, but which are generally more water soluble (with consequent potential for contaminating surface and ground water) and are often also more acutely toxic.

1970 - US Environmental Protection Agency officially formed

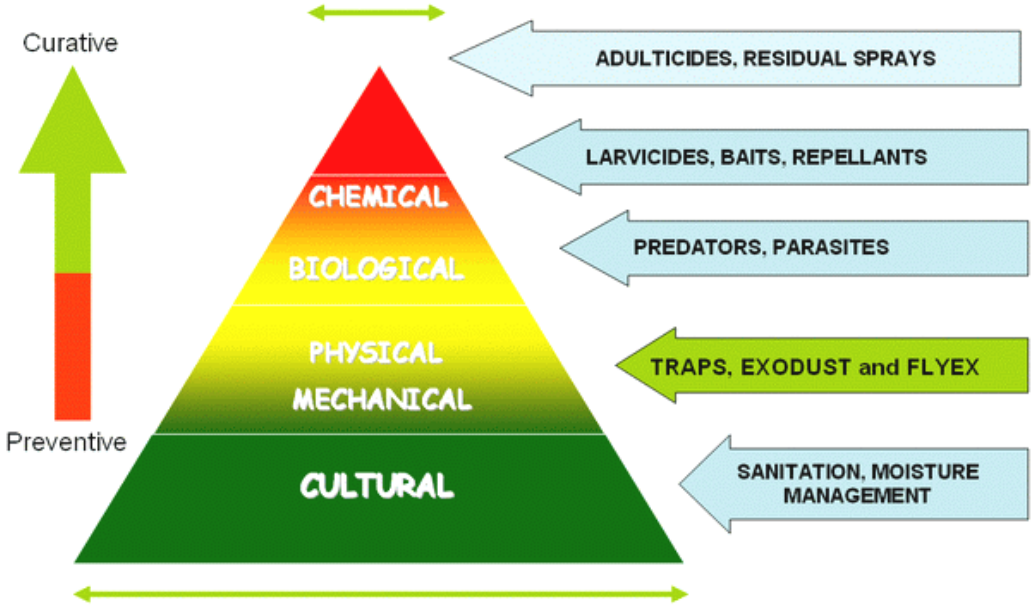
1972 - Federal Environmental Pesticides Control Act

This was a major revision of the Federal Insecticide, Fungicide, and Rodenticide Act (**FIFRA**), which is a United States federal law that set up the basic US system of pesticide regulation to protect applicators, consumers, and the environment.

1977 - IPM program started in California Department of Food and Agriculture

1979 - IPM mentioned in President Carter's Environmental Message; President Carter's Memorandum to Federal agencies to adopt IPM strategies

Integrated Pest Management



Integrated pest management (IPM) is an

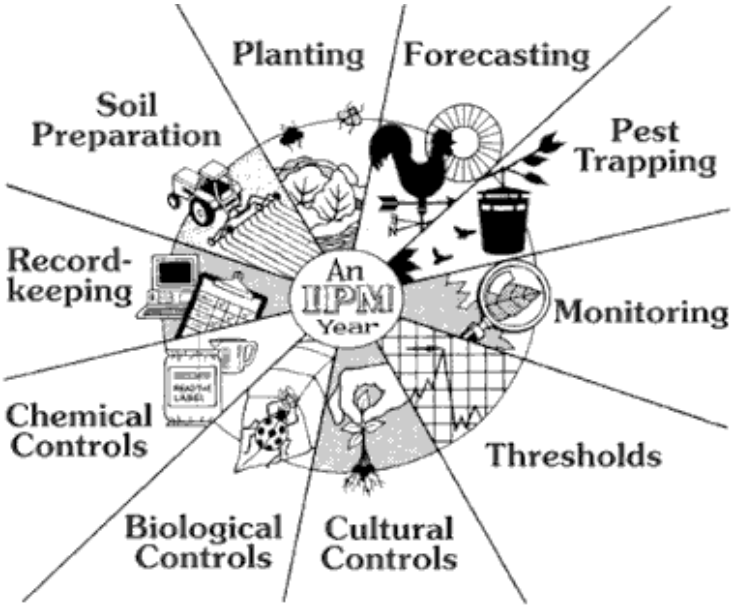
- ecosystem-based strategy that
- focuses on long-term prevention of pests or their damage through a
- combination of techniques such as
  - biological control,
  - habitat manipulation,
  - modification of cultural practices, and
  - use of resistant varieties.

Integrated Pest Management (IPM)

IPM reduces dependence on pesticides by integrating non-chemical methods to help control or prevent pest populations.

<u>IPM Practices</u>

- Identify the pest
- Use surveillance of some type to evaluate pest level
- Don’t make applications based on a calendar



This primarily applies to crop pests. What about mosquitoes?

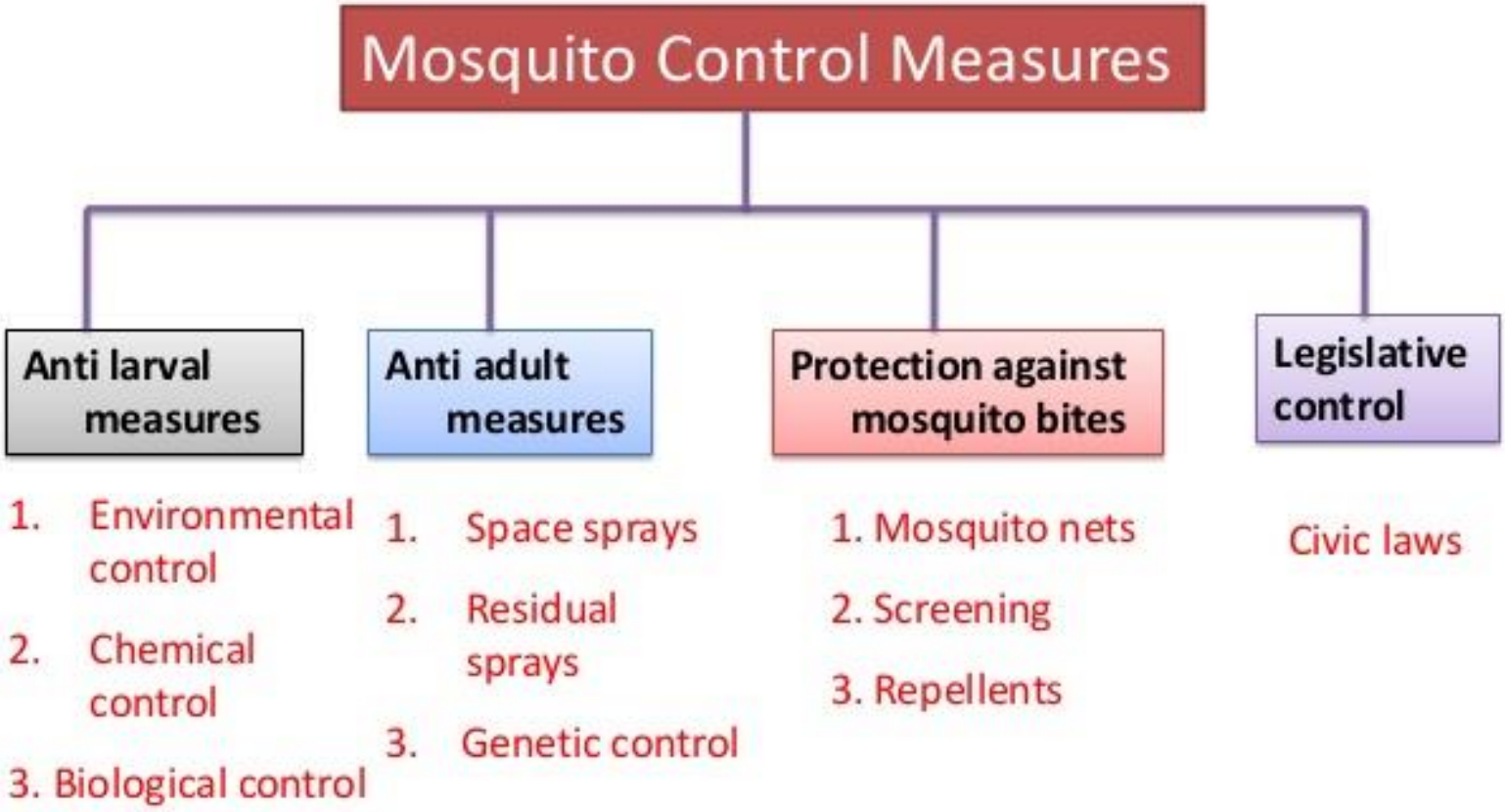
Some Mosquito Control History

- Waste oil or diesel oil products were implemented to control mosquito larvae in the early 1800s
- Paris green dust, an arsenical insecticide, was developed as a larvicide in 1865 and, along with undiluted diesel oil, was used through the 1960s
- Larviciding became prominent when implemented as an area-wide malaria control procedure in the early 1900s
- After 1945, DDT, a chlorinated hydrocarbon compound, was used as both an adulticide and a larvicide - mosquitoes became resistant to DDT, and its use was discontinued in the late 1950s
- In the 1950s, malathion, an organophosphate, was used increasingly to control both larval and adult mosquitoes - soon, resistance to malathion was observed in saltmarsh mosquitoes

The pesticides used for mosquito control over the years have varied greatly in structure, toxicity, persistence, and environmental impact. These include the following:

- **Organochlorines – including DDT, BHC, methoxychlor, chlordane, heptachlor, aldrin, and dieldrin**
- Organophosphates (OPs) –
  - Adulticides - malathion (Fyfanon®) and naled (Dibrom®)
  - Larvicide - temephos (Abate®)
- Pyrethroids –
  - Natural
  - Synthetic
- **Carbamates - propoxur**
- Insect Growth Regulators (IGRs)
- Biorationals/Biologicals
- Oils and monomolecular films (surfactants)

Integrated vector control approach for mosquito



Integrated Mosquito Management: No New Thing

More than 100 years ago, General William C. Gorgas used a **multifaceted approach** to control mosquitoes when he and his staff brought yellow fever under control in Havana after the Spanish-American War.

In New Jersey at the turn of the century, state entomologist John B. Smith was convinced that the state could be made mosquito free.

- The laws of 1902 provided for funding to study mosquitoes and resulted in Smith's comprehensive study of the subject.
- Smith's work led to **water management** as a primary means of controlling mosquitoes on New Jersey's extensive salt marshes.
- He addressed the issue of **biological control** by native fish, primarily saltmarsh killifish.

Integrated Mosquito Management: No New Thing

When the New Jersey Mosquito Extermination Association was formed in 1913, state mosquito control workers began what has been a long involvement with **education** and **public relations**.

These critical components of IMM have long been an essential part of mosquito control activities throughout the United States.

Regarding **surveillance**, the laws of 1905 charged the director of the New Jersey Agricultural Experiment Station with conducting surveys of mosquito breeding in the various political entities of the states.

The standard tool for surveillance, the New Jersey light trap, was developed in the 1930s and has been in regular use since then.

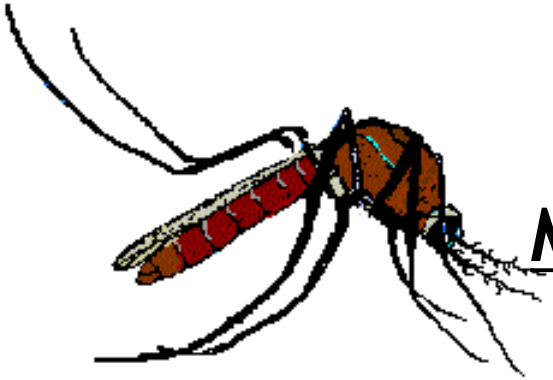
Managing Resistance

Pest resistance to a pesticide can be managed by reducing selection pressure by this pesticide on the pest population.

This can be achieved by:

- avoiding unnecessary pesticide applications
- using non-chemical control techniques
- leaving untreated refuges where susceptible pests can survive

Adopting the integrated mosquito management (IMM) approach usually helps with resistance management.



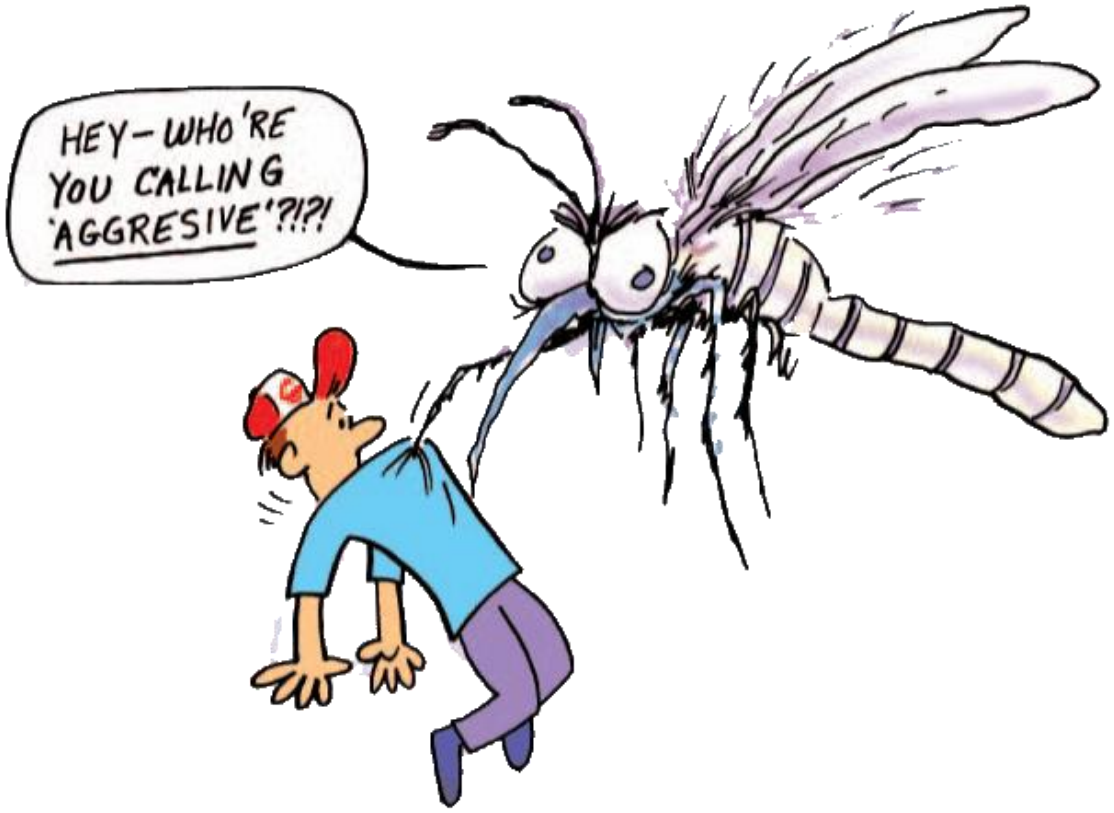
MOSQUITO MANAGEMENT

"The integrated mosquito management process consists of the balanced use of cultural, biological, and least-toxic chemical procedures that are environmentally compatible and economically feasible to reduce pest and disease-vector populations to a tolerable level."

It is important that mosquito control agencies maintain a broad selection of tools, both chemical and non-chemical, to use in managing mosquito populations.

We have very few tool, so we must use them wisely.

Any Questions?



http://dph.georgia.gov/zoonoticvector-borneinfestations

http://www.GAmosquito.org