

Pest Control

Persistence and Mobility in the Environment

- Because DDT and other chlorinated hydrocarbons are so stable, have high solubility, and high toxicity, it makes them effective pesticides, as well as environmental nightmares.
- Often bio-accumulate in animal fat, leading to bio-magnification in predators like falcons.
- Grasshopper Effect: substances evaporate from warm regions and precipitate in colder regions, accumulating in great concentrations in top predators up north.
- DDT byproduct has been found to be able to enter a woman's amniotic fluid, which can be dangerous to the developing baby even in small amounts.
- POPs (persistent organic pollutants) like Atrazine and alochlor are so dangerous and long-lasting, 127 countries agreed to ban them. The 12 most dangerous (dirty dozen) have been banned
- Pesticide can either have short term effects on human health or long term effects. Short term effects include poisoning and illness from high exposure doses. Long term effects include cancer, birth defects, Parkinsons, and other degenerative diseases.
- 3.5- 5 million people suffer acute pesticide poisoning each year. 20,000 die from it.
- farmers who use pesticides are 8 times more likely to develop non-Hodgkin's lymphoma.
- long-term exposure and consumption of contaminated foods can cause learning disorders in the generations that were developing with the pesticides.

Alternatives

Behavioral changes

- crop rotations, flooding fields, burning crop residues, restoring windbreaks, hedge rows, and groundcover allows bird and other predators perches from which to eat insects. Adjusting planting times could avoid pest concentration, growing where pests are not prevalent, and tilling and diversifying species can prevent losses from pests.
- Biological controls- predator insects (mantises, wasps, ladybugs), pathogens, as well as ducks and geese, which eat insects and weeds, and are harmless to crops. Often times they will continually provide protection year after year. Herbivorous insects also control populations of hardy weeds.
- bio-engineered sterile males can fight against pests or plants that are engineered to be resistant to insects or weeds.
- development of upsetting hormones and sex lure traps have been used to stop the spread of pest insects.

Integrated Pest Management

- a flexible, ecologically based pest control strategy that carefully applies techniques at specific times, intervals, and aimed at specific pests. It determines economic threshold at which pesticides need to be applied to justify returns.
- trap crops are grown a week before other crops, mature early, attract the insects, and are sprayed with pesticides. Thus, they detract pests away from the real crop.
- many countries and states like Massachusetts, Brazil, Cuba, and Costa Rica have had remarkable success transforming their agriculture with IPM.
- in Indonesia, pests that once ran rampant were controlled by the education of poor farmers in the benefits of IPM. Because the staple crop is rice, it could be important for other countries.

Reducing Pesticide Exposure

Regulating pesticides

- many of the thousands of tons of pesticides in the U.S. contain suspected carcinogens and pose human health hazards.

- EPA regulates through scientific studies which pesticides pose health risks.
- FDA & USDA- enforce EPA rulings, have authority to destroy food shipments that do not conform.
- Delaney Clause- added in 1958 to the U.S. FFDCFA that states that any cancer causing agent cannot be added to processed food, drugs, or cosmetics.
- has been revamped, now law has been restated, saying that if the risk is so slight that it has "little" effect (it just kills you slowly), the additive can be used.
- now, pesticides like methyl parathion and other harmful ones have been banned for use on fruit because of human health concerns. These pesticides can damage human internal organs.
- however, many people agree that carcinogens from food are relatively unimportant as opposed to the natural carcinogens all around us.

A Personal Plan

-don't use chemicals on your yard and garden. Clean up spilled food to eliminate insects. Wash houseplants to get rid of pests. Drown slugs in stale beer in a saucer. Drain stagnant water to discourage mosquito breeding. Use toxic chemicals in only the smallest possible amounts. Read magazines on being organic and healthy.

HISTORY:

- 5,000 yrs, ago. Sumerians: sulfur
- 2,5000 yrs ago: China: mercury, arsenic. Greek/Roman: oil sprays, ash, sulfur, lime.
- Also: burn fields, rotate crops, spices and alcohol for spoilage
- 1,200 yrs ago: predatory ants in China used for caterpillar control
- 1934 DDT discovered by Paul Muller controls insects
- 1943 first DDT produced on large scale, used on fields, forests, and cities.
- 1960's discovery that predatory birds had softened egg shells from DDT- passed through food webs
- 1970s DDT use banned

PESTICIDE USE:

US uses the most pesticides in the world :(
Monoculture growing practices causes need for more insecticide use

PESTICIDE TYPES

- Inorganic pesticides- arsenic, copper, lead and mercury compounds. Highly toxic, indestructible, neurotoxin, harmful to humans.
- Natural organic pesticides (botanicals)- extracted from plants, nicotine, rotenone (from roots of debris plants- kills fish), pyrethrum (Chrysanthemum extractions), coniferous oils.
- Fumigants- easily dispersed gasses to sterilize soil, prevent decay/rodents/insects harmful to humans- banned [ex: carbon disulfide]
- Chlorinated hydrocarbons (organochlorines)- synthetic organic insecticides, toxic and long lasting, banned, blocks nerve signals, [ex: DDT, aldrin]
- Organophosphates- lethal, but only for short time period, quickly dissipate, damages nervous system not persistent, low bioaccumulation [ex: DDVP]
- Carbamates (urethanes)- not persistent, low bioaccumulation, damages nervous system, kills bees esp. [ex: Sevin, Temik, Baygon]
- Microbial agents & Biological controls- pest control using living organisms [ex: ladybugs eat aphids, parasitic wasps lay eggs in caterpillars]

PESTICIDE BENEFITS:

- Disease control- insects that carry diseases are killed, thus decreasing human suffering [ex: malaria via mosquitoes]

-crop production- crop loss is decreased by eliminating pest, farmers save \$3-5 for every \$1 spent on pesticides

PESTICIDE PROBLEMS:

-other species- sometimes wipe out area of all living organisms [ex: bees die, thus bee keeper profit goes down, and crops not well pollinated. Sacramento River herbicide dumped and river ecosystem decimated]

-pest and pesticide resurgence. Resistant genes are being communicated between species - problem is having used pesticides so abundantly, no longer as useful and effective

-pest creation- predators are reduced by pesticides, predator controls are gone, thus lower trophic levels explode [ex: Canete Valley, Peru]

DEFINITIONS:

Biological pest- organism that inhibits use of resources

Pest control- any method of killing pests

Pesticide- chemical that kills pests

Biocide- kills many kinds of organisms

Herbicide- kills plants

Insecticide- kills insects

Fungicides- GUESS. (kills fungi)

Pest resurgence (rebound)- quick reproduction cycle causes pests to re-populate with pesticide-resistant individuals

Pesticide treadmill- using increasing dosages of pesticides to catch up with higher resistance in pests

STATS:

90% of pesticides world wide used in agriculture or food storage/transport

34 pesticides used in US are in agriculture

59% herbicides

22% insecticides

11% fungicides

8% other

90% pesticides never get to organism intended!!!!