

Pesticides

- **Pesticides** are chemicals designed to kill pests.



<http://www.youtube.com/watch?v=BcKt2R-xv6I&safe=active>

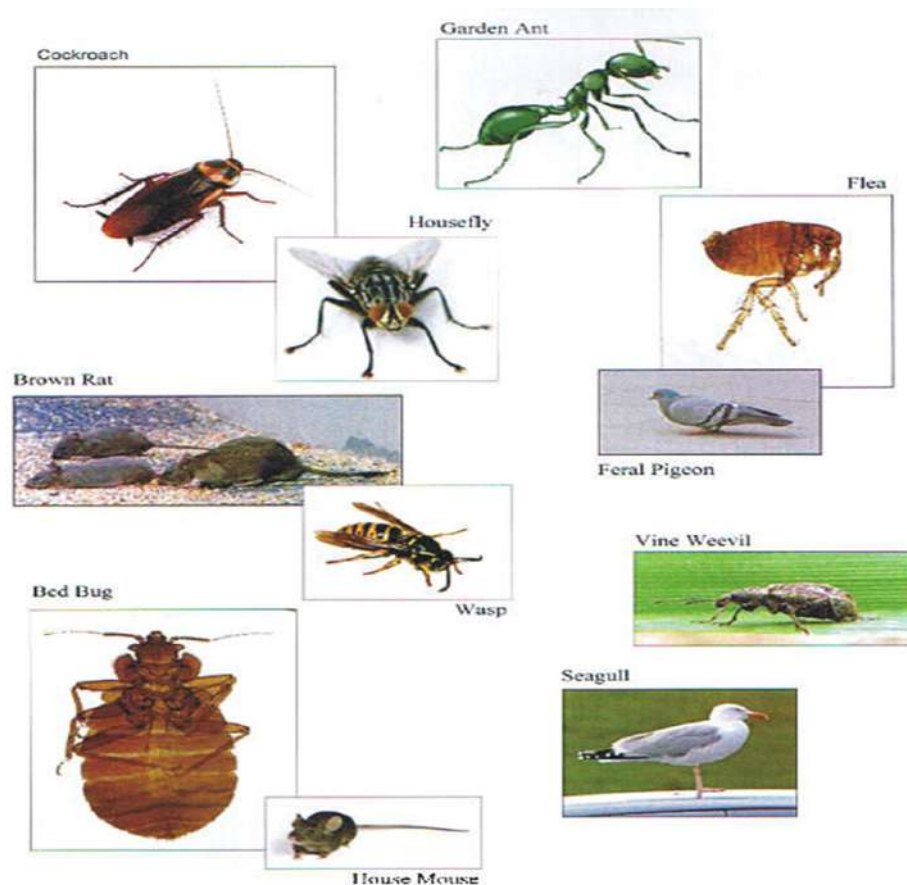
Categories of Pesticides

1. Insecticide: kills insects (ex: DDT)
2. Herbicide: kills weeds (ex: Roundup)
3. Fungicide: kills moulds and other fungi (ex: Captan)
4. Bactericide: kills bacteria (ex: Penicillin)

What is a pest?

- A **pest** is any organism that we believe is harmful or undesirable, has a negative impact on the human environment, or is in competition with human use of a resource, either natural, or cultivated
- Examples: dandelions, rodents or insects that eat crops; micro-organisms that cause disease in forest, fish, or crop resources, etc.

Pests



Fact about Pesticides

- There have been thousands of pesticides developed to kill pests
- Approximately 2.3 million tons of pesticides used yearly all over the world; 25 % of pesticides are used to get rid of pests in homes, gardens and parks


Early Pesticide Use (first Generation):

- Early Pesticide included the use of toxic substances such as **lead salts, arsenic, or mercury.**
- Generally effective against the intended pest, but also created some environmental problems because they also killed beneficial organisms, and caused pollution
- Results : Early pesticides began to accumulate in the environment, contaminating water and soil resources, eventually poisoning humans

Second Generation:

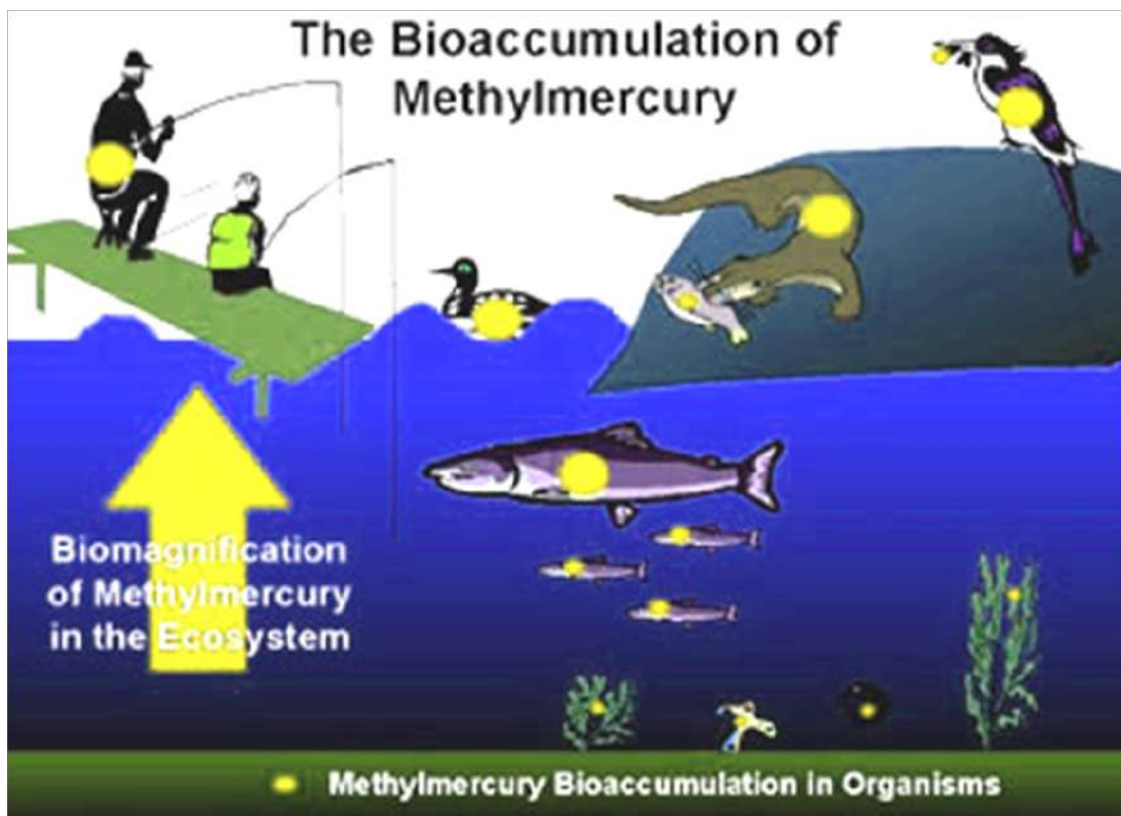
- By the 20th C, chemists began to develop **organic pesticides** that were designed to be less toxic to humans and more specific toward the intended pests
- Most early pesticides were non-biodegradable (do not break down within the ecosystem) thus stored in fat tissue and not soluble in water
- Initially this was believed to be a step in the right direction, **BUT** it was discovered that they also caused unexpected environmental effects (DDT)

Video : DDT & pesticides

 http://www.youtube.com/watch?v=JH2-9o59_n0&safe=active

Bioaccumulation:

- Increase in concentration of a pesticide from the environment in all organisms in a food chain
- As each organism feeds on one lower in the food chain, the fat-soluble toxin began to be concentrated in ever higher amounts as one moved toward the top of the food pyramid.
- Bioaccumulation may occur in many different food chains when the dead pests or other non-specific organisms are eaten.

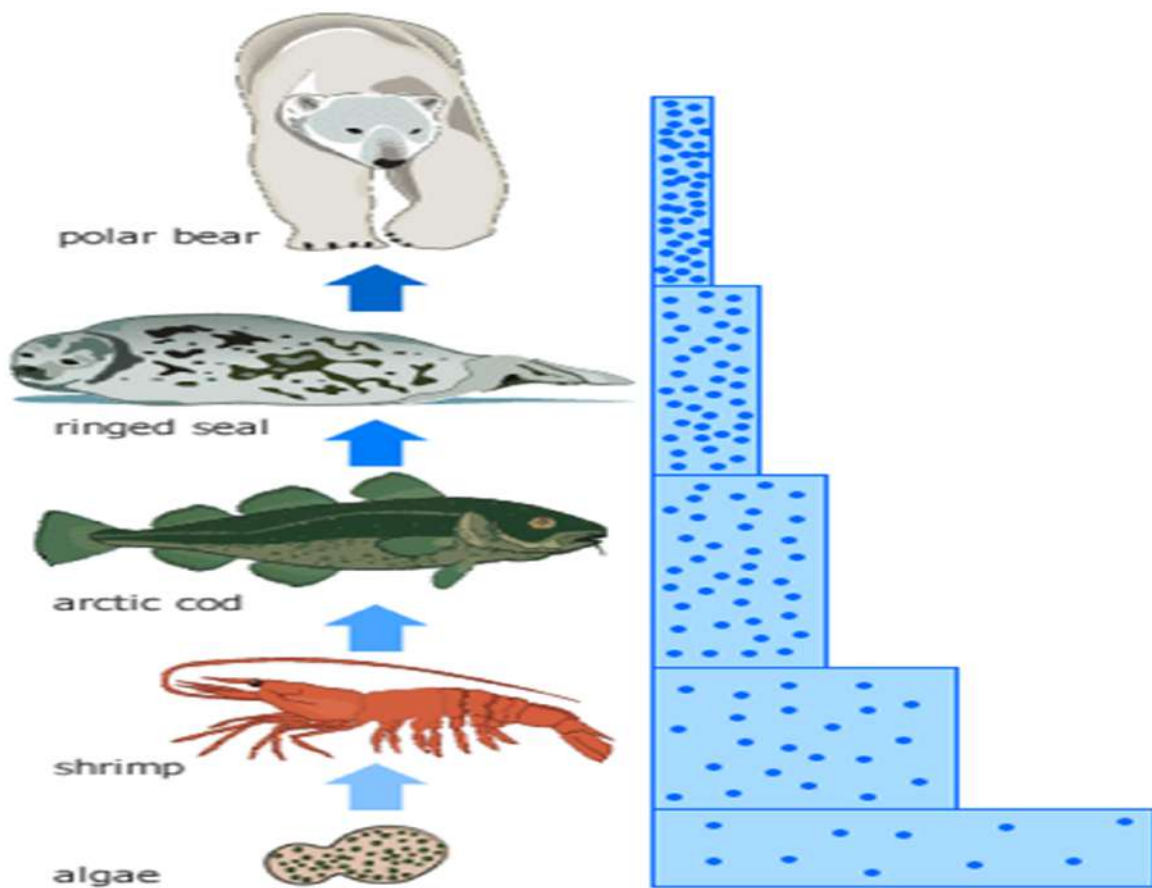
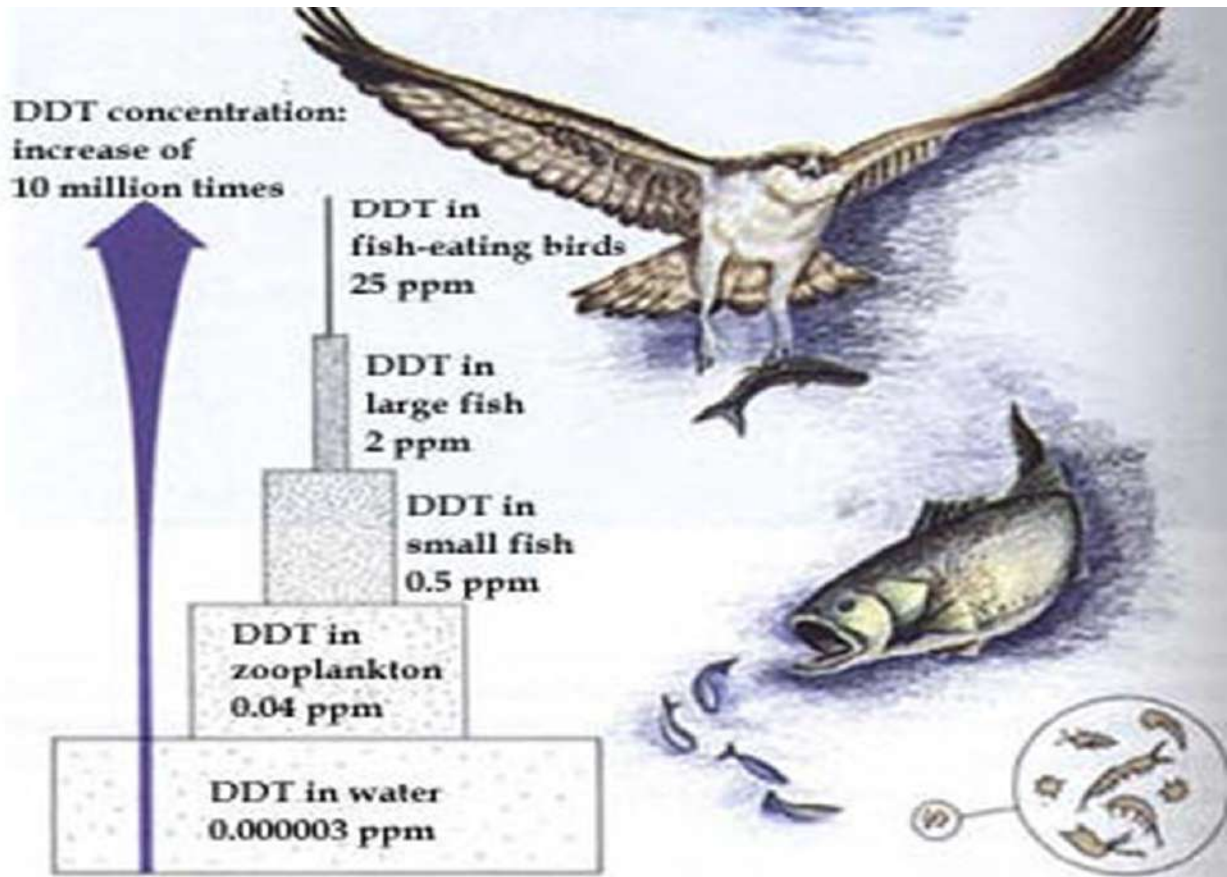


Bioamplification:

- The higher up the food chain, and thus the higher the trophic level, the higher the concentration of toxins
- Since every organism eats far more than its own body mass in food, the tiny amounts found in each organism in the lower levels of the food web began to accumulate in greater concentrations in species located at higher trophic levels.
- One example of this problem is illustrated by the damage done to predatory birds as a result of DDT (Ex. Bald Eagles)
- As a result of this problem, DDT has been banned from use in North America

Effects of DDT on Top Predators

- Shell thinning
 - > Carnivorous birds such as ospreys and bald eagles eat other birds, dead animals and fish which contain a build-up of DDT
 - > DDT causes the shells to become too thin to allow the large females to sit on the eggs without them breaking
 - > Since eggs are being broken, the over-all population of these birds is declining
- After DDT was banned in the US and Canada in the early 1970's the bird populations of recovered.
- DDT bioaccumulates in humans the same as it would other animals
- Male birds have also become more feminine as the DDT mimics female sex hormones



The Impact Bioamplification:

- Long-lived - Present for a long time in the system
- Mobile - Easily passed up the food chain
- Soluble in fats -Dissolves in, and is stored in fatty tissue
- Biologically active – Affects biological body tissue

- Not all countries, like Mexico for example, have banned the use of DDT

Since birds migrate from winter to summer from one country another, birds are are not 100% safe from the presence and the effects of DDT because the ecosystem in Mexico is contaminated.

Modern Pesticide Use (Water Soluble):

- Newer pesticides are developed that are not stored in fat tissue but are **soluble in water** (animals can remove these pesticides from their bodies by breaking them down with their liver and excreting them; they are also broken down in soil a lot faster)
- Water soluble pesticides do their job in killing pest but they also cause other problems that have to be considered

Problems with Water-soluble pesticides:

- Often, more than one application of these pesticides has to be applied to an area because they do not kill all the pests right away. Insects becoming more resistant to the pesticide thus a **resistant population of insects can be created**
- Because they decompose faster in the soil, they don't last as long and thus may not reach targeted pests. Thus, they have to be applied more often.

Problems with Water-soluble pesticides:

- They affect other organisms in the ecosystem besides the pests they are suppose to kill. Thus humans are at risk as well as other plants and animals
- Even though water soluble pesticides cause problems and pose risks to the environment, they are still considered safer than pesticides such as DDT and are the lesser of “two evils”

video: affects of pesticides

http://www.youtube.com/watch?v=1-fXYR9FTfM&safety_mode=true&safe=active&persist_safety_mode=1



Attitudes Towards Pesticides

- We use less of them, they are not sprayed unnecessarily
- They are weaker than they used to be so that pests are controlled rather than eliminated
- More environmentally friendly – less toxic to people and animals that are not intended to be harmed



Case study Pesticides