



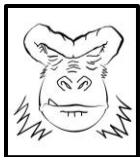
APES in a BOX: The Review Sessions

Pest Management and Chemicals in the Environment

Pest Control

Pesticides have been used for hundreds of years to increase crop yields. Pesticides include herbicides, insecticides, rodenticides, algicides, and fungicides. Using pesticides in agriculture began several thousand years ago by dusting plants with sulfur. This practice graduated to the use of chemicals like arsenic, lead, and mercury. You can probably guess why this wasn't such a good idea! Eventually we started looking to nature for plants that did not seem to have many pest problems and from these plants we extracted chemicals to apply to croplands. During the 1900s we learned how to make synthetic pesticides such as DDT. These pesticides are extremely effective, but are not without problems. It was discovered that some of these pesticides could take part in a process called biomagnification. **Biomagnification** occurs when a chemical enters living organisms such as algae, and then concentrates in the bodies of other organisms as the chemical travels up the food chain. DDT is one of these chemicals, and was shown to biomagnify until it caused reproductive problems in large predatory birds at the top of the food chain.

Some problems with pesticides include the development of pesticide resistance, high cost of application, and potential harmful effects on wildlife and humans when pesticides enter the ecosystem. **Pesticide resistance** occurs when pesticides are applied, susceptible organisms are killed, and non-susceptible organisms are left behind. These "pesticide resistant" organisms survive to pass on their genes to the next generation. Over time, the pesticide becomes useless as the pest population evolves resistance. This process is often referred to as the "pesticide treadmill" as the development of pesticide resistance requires increased application of pesticides, which in turn leads to more resistance!



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Biological Pest Control and Integrated Pest Management

There are several pest control methods that do not require the use of chemical pesticides. Some examples include the introduction of pest predators, using pest pheromones to attract the pests to traps, using pest hormones to disrupt the pest's life cycle, or using crop rotation to combat specialist pest species. Perhaps one of the more devious biological pest management strategies involves the release of sterile male insects into the general pest population. The females mate with the sterilized males, assume that they have mated successfully, and then miss the breeding season. **Integrated Pest Management (IPM)** involves multiple strategies to reduce the use of pesticides. With an IPM program the goal is not necessarily to eradicate a pest species, but to reduce the pest damage to an acceptable level. With IPM the farmer uses cultivation techniques that disrupt pests, biological pest control methods, and if necessary they may use small amounts of narrow-spectrum pesticides. IPM provides great hope for an ecologically sustainable pest management option. Disadvantages of an IPM program include a high initial investment and education for farmers. IPM also takes a longer amount of time to be effective than traditional practices.

The Fine Print

The **Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)** regulates the distribution, sale, and use of pesticides. The act also requires large pesticide users to register their purchase.

The **Federal Food, Drug, and Cosmetic Act** give the EPA the power to establish safe levels for pesticides used in food and animal feed.

Endocrine disruptors

Some chemicals are recognized by living organisms as hormones. These chemicals are known as endocrine disruptors because of the impact that they have on a living organisms body. When these chemicals enter an organism they impact the body in the same way that introducing more of the organisms own hormones might. This can lead to reproductive difficulties in certain organisms. Studies have shown that alligator populations in Lake Apopka Florida have experience reproductive difficulties and immune system impairment in response to exposure to hormone mimicking chemicals dumped into the lake.

Love Canal Incident

Love canal was a neighborhood in Niagra Falls, NY. The land was formerly owned by Hooker Chemical, and used as a dumping site for the company's toxic waste. In



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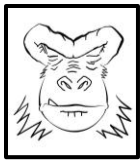
1953 Hooker Chemical sold the land to the local school district. As construction of homes and schools progressed some of the chemicals began to surface. Studies showed a higher than normal rate of miscarriages and birth defects amongst love canal residents.

Bhopal Disaster

In 1984 a leak of toxic gasses from a pesticide plant in Bhopal, India caused a large number deaths, and related illness. Over 3,500 deaths were attributed to the incident.

Minamata Disaster

Minimata Disease was discovered in Minamata city, Japan in 1956. Chemical factories in the town had released methylmercury into the local bay. The methyl mercury biomagnified through the food chain, and ultimately contaminated the food that was eaten by local residents. The mercury poisoning lead to a high incidence of nervous system damage, and ultimately death.



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Pesticide and Toxicology Review Questions

Use the following answer for questions 1-5

- A) Biomagnification
- B) Integrated Pest Management
- C) Biological Pest Control
- D) Pesticide Treadmill
- E) Endocrine Disruptor

1. A pest control strategy that uses sustainable cultivation practices, biological pest control, and limited use of narrow spectrum pesticides to reduce pest damage to an economically tolerable level.
 2. An industrial chemical that mimics an organisms own hormones once the chemical has made it inside the organism's body.
 3. Refers to the development of pesticide resistance through the increased use of pesticides against resistant pest populations.
 4. Refers to the use of living organisms to combat pest populations.
 5. Refers to the increase in concentration of certain chemicals as those chemicals work their way up through a food chain.
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6. Which of the following incidents involved a major gas leak from a pesticide factory? Thousands were killed or injured in the event.
 - A) Minamata Disaster
 - B) Bhopal Disaster
 - C) Chernobyl
 - D) Love Canal Incident
 - E) Three Mile Island Incident
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7. Which of the following events involved the biomagnification of mercury eventually causing birth defects and mental retardation in the human population?
 - A) Minamata Disaster
 - B) Bhopal Disaster
 - C) Chernobyl
 - D) Love Canal Incident
 - E) Three Mile Island Incident



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Multiple Choice Scoring Guidelines

1. B	3. D	5. A	7. A
2. E	4. C	6. B	

Multiple choice points earned/10 * 100 = Quiz average

(_____)/ 10 * 100 = _____ Quiz Grade