



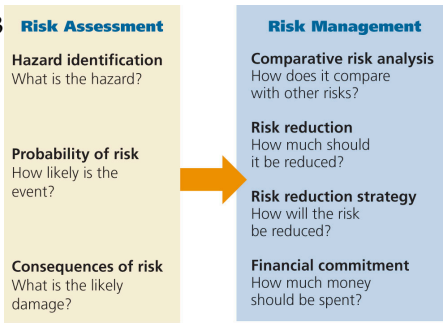
Chapter 17: Environmental Quality

APES 2013

1

Risk

Fig. 17-3



- ◆ Risk assessment - statistical analysis of how much harm a hazard can have to human health or the environment
- ◆ Risk management - deciding how to deal with a risk
- ◆ People do not understand risk well
 - ◆ Avian flu vs. Common flu

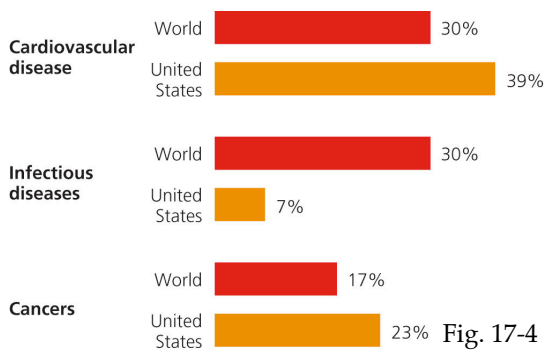
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Types of Hazards

- ◆ Biological - pathogens (causes disease) like bacteria, viruses...
- ◆ Chemical - harmful chemicals in the air, land, and water
- ◆ Physical - fire, earthquakes, volcanic eruptions, floods, storms
- ◆ Cultural - unsafe working conditions, criminal assault, poverty
- ◆ Lifestyle - smoking, eating, drinking, sex

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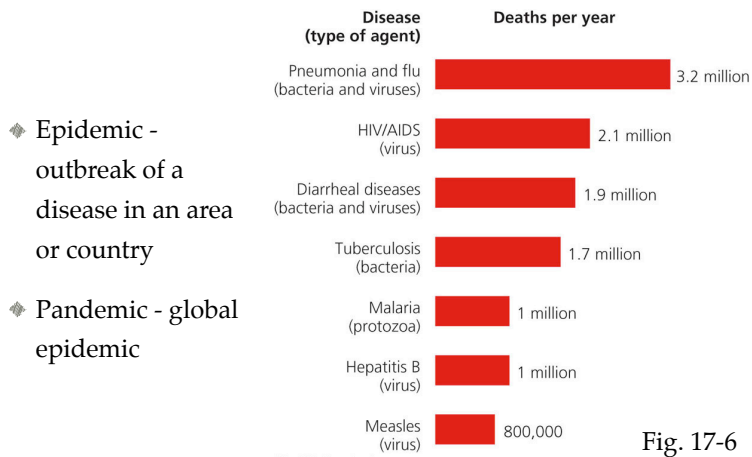
Disease



- ◆ Nontransmissible disease - does not spread from one person to another (ex. cardiovascular disease, cancers, asthma)
- ◆ Infectious disease - pathogen invades the body (flu, HIV, malaria)

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Infectious Disease



- ◆ Epidemic - outbreak of a disease in an area or country
- ◆ Pandemic - global epidemic

Fig. 17-6

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Malaria

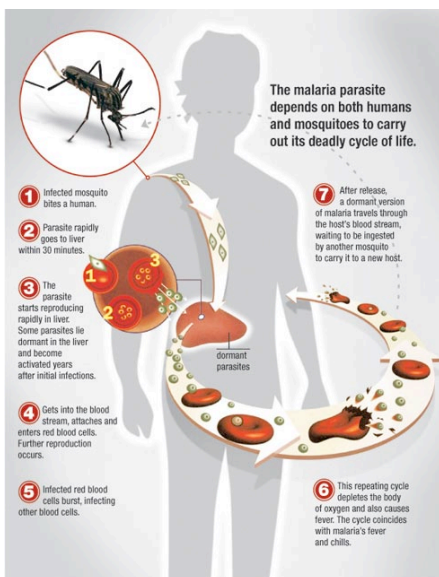


Fig. 17-7

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SOLUTIONS

Infectious Diseases

- Increase research on tropical diseases and vaccines
- Reduce poverty
- Decrease malnutrition
- Improve drinking water quality
- Reduce unnecessary use of antibiotics
- Educate people to take all of an antibiotic prescription
- Reduce antibiotic use to promote livestock growth
- Require careful hand washing by all medical personnel
- Immunize children against major viral diseases
- Provide oral rehydration for diarrhea victims
- Conduct global campaign to reduce HIV/AIDS



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Fig. 17-10

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Chemicals

- ◆ Toxic Chemicals - cause temporary or permanent harm or death to humans and animals
 - ◆ FDA lists arsenic, lead, mercury, vinyl chloride, and polychlorinated biphenyls as five most toxic substances
- ◆ Carcinogens - chemicals, types of radiation, and viruses that can promote cancer
- ◆ Mutagens - chemicals or forms of radiation that cause mutations in DNA
- ◆ Teratogens - chemicals that cause harm or birth defects

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Toxic Chemical Pathways

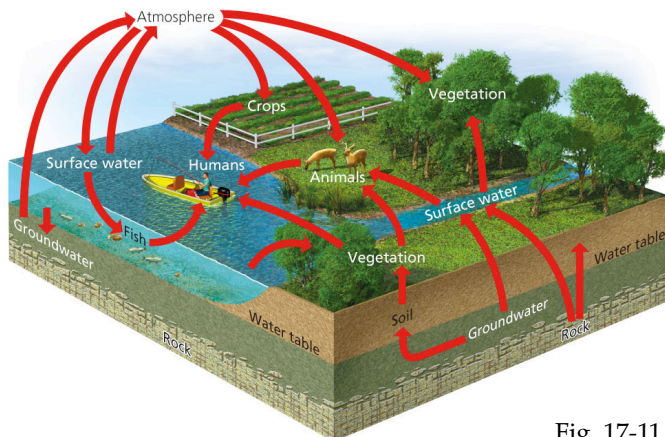


Fig. 17-11

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PCBs

- ◆ More than 200 chlorine-containing organic compounds
- ◆ From 1920s-1970s used as lubricants, hydraulic fluids, and electrical insulators among other products
- ◆ Banned in 1977
- ◆ Currently found in air, water, and soil around the world and can travel long distances

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Mercury

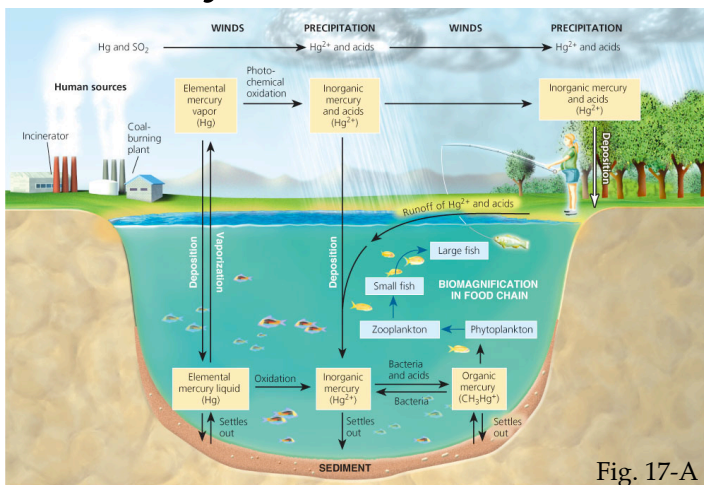


Fig. 17-A

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SOLUTIONS

Mercury Pollution

Prevention

- Phase out waste incineration
- Remove mercury from coal before it is burned
- Switch from coal to natural gas and renewable energy resources such as wind, solar cells, and hydrogen
- Convert coal to liquid or gaseous fuel
- Phase out use of mercury in batteries, TVs, compact fluorescent lightbulbs, and all other products unless they are recycled



Control

- Sharply reduce mercury emissions from coal-burning plants and incinerators
- Tax each unit of mercury emitted by coal-burning plants and incinerators
- Require labels on all products containing mercury
- Collect and recycle mercury-containing electric switches, relays, and dry-cell batteries

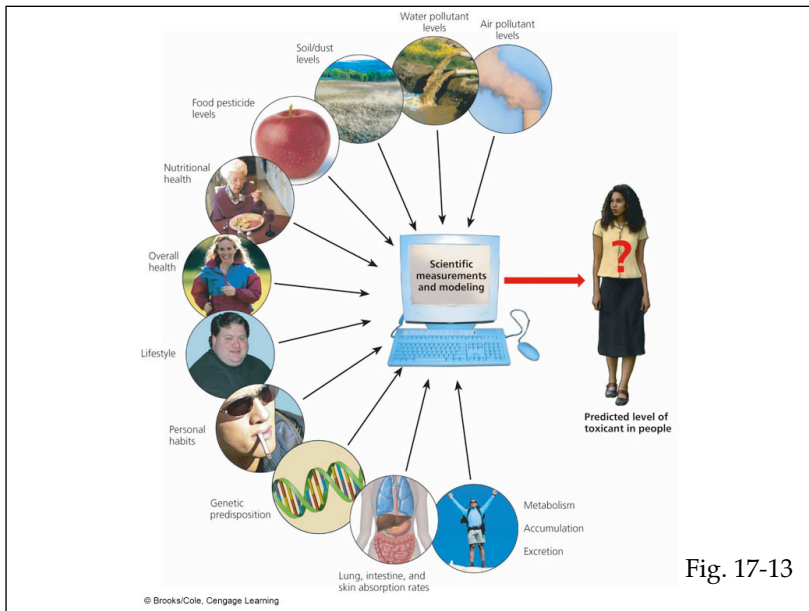
Fig. 17-B

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Toxicology

- ◆ Toxicology - study of harmful effects of chemicals on organisms
- ◆ Toxicity - measure of how harmful a substance is (any synthetic or natural chemical is harmful if ingested at a large enough quantity)
- ◆ Dose - amount ingested
- ◆ Response - damage resulting from exposure

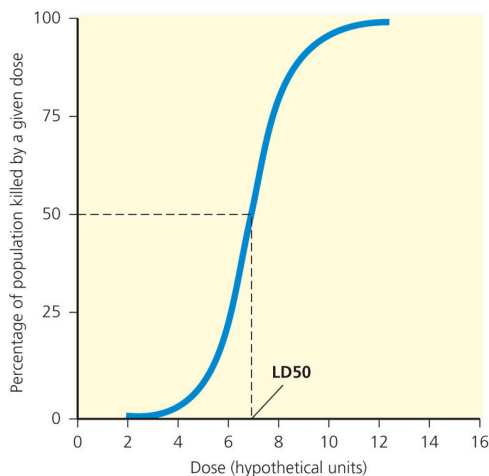
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Estimating Toxicity

- ◆ Dose-response curve - determining effects of dose and plotting them
- ◆ LD50 - median lethal dose, dose that kills 50% of animals



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Types of Dose-Response Curves

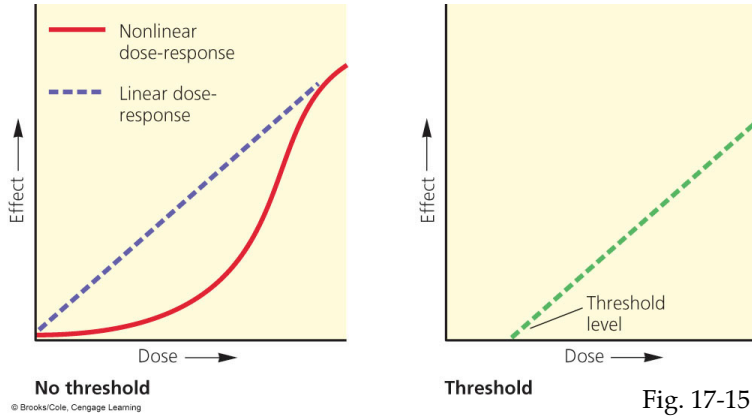


Fig. 17-15

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Toxicity Ratings

Table 17-1

Toxicity Ratings and Average Lethal Doses for Humans			
Toxicity Rating	LD50 (milligrams per kilogram of body weight)*	Average Lethal Dose**	Examples
Supertoxic	Less than 5	Less than 7 drops	Nerve gases, botulism toxin, mushroom toxin, dioxin (TCDD)
Extremely toxic	5-50	7 drops to 1 teaspoon	Potassium cyanide, heroin, atropine, parathion, nicotine
Very Toxic	50-500	1 teaspoon to 1 ounce	Mercury salts, morphine, codeine
Moderately toxic	500-5,000	1 ounce to 1 pint	Lead salts, DDT, sodium hydroxide, sodium fluoride, sulfuric acid, caffeine, carbon tetrachloride
Slightly toxic	5,000-15,000	1 pint to 1 quart	Ethyl alcohol, Lysol, soaps
Essentially nontoxic	15,000 or greater	More than 1 quart	Water, glycerin, table sugar

*Dosage that kills 50% of individuals exposed.
 **Amounts of substances in liquid form at room temperature that are lethal when given to a 70-kilogram (150-pound) human.

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Toxic Chemical Sources

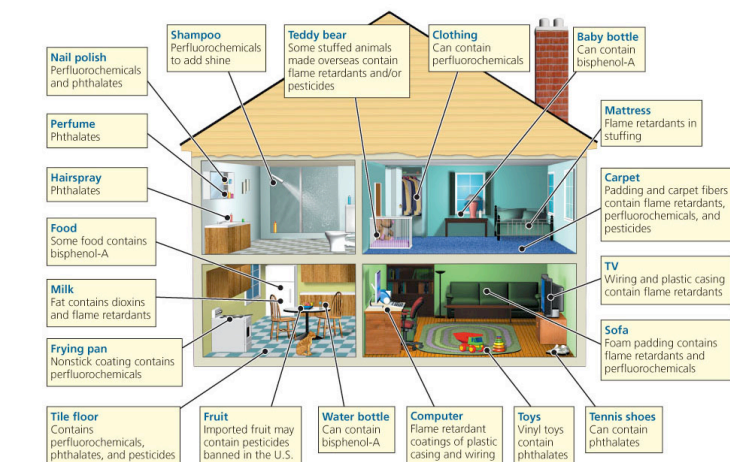


Fig. 17-16

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Risk Analysis

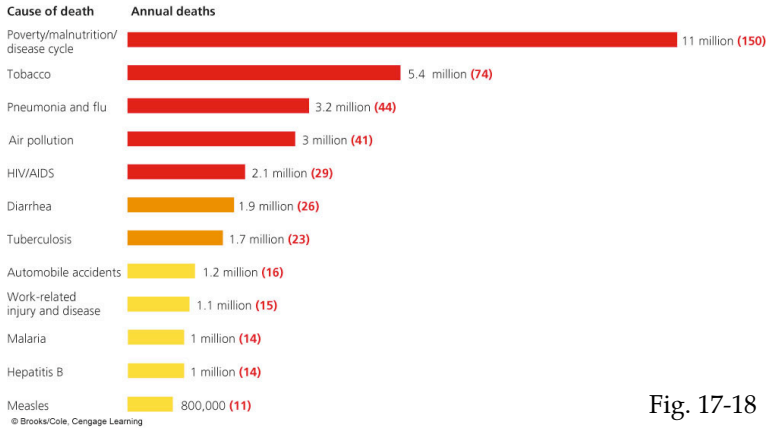


Fig. 17-18

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Risk Analysis

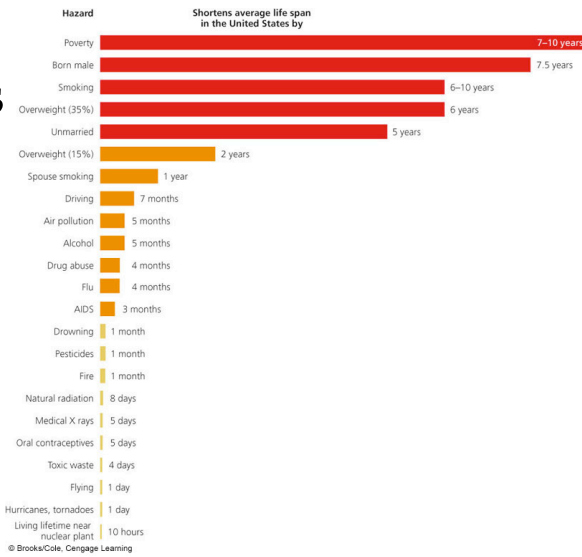


Fig. 17-19

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Risk Analysis

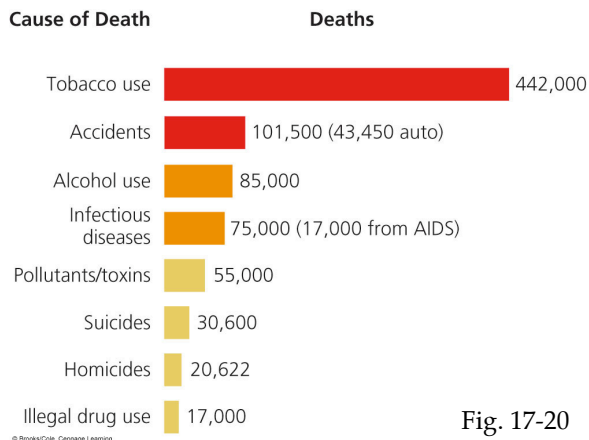


Fig. 17-20

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