

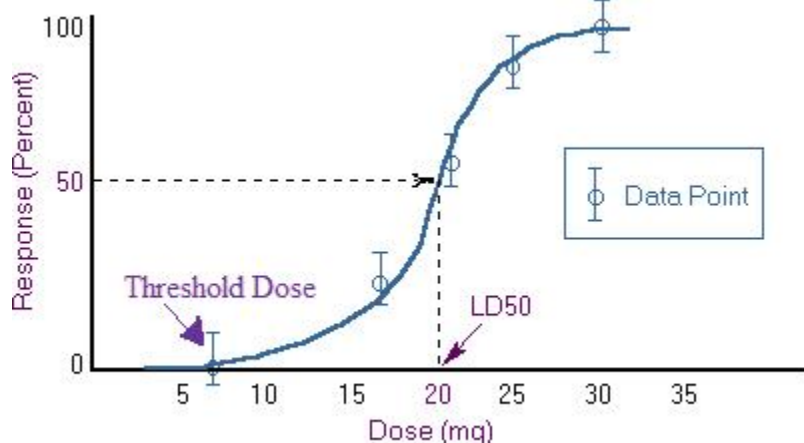
Toxicology & Waste

Toxicity is measured by dose-response analysis.

LD₅₀: the dosage of a toxin it takes to kill 50% of the population

-Threshold toxin: a toxin that shows a negative affect only after a certain (threshold) dosage

-Non-threshold toxin: a toxin that shows a linear direct response to toxin with dosage exposure



Factors that Affect Toxicity:

- exposure/dosage
- size of organisms
- genetic resistance/ability to detoxify toxin (if toxin accumulates... Bioaccumulation!)
- synergistic affects with other toxins
- *Review kinds of toxins!

Acute Effects: caused by short exposure to high levels of toxin

Chronic Effects: caused by long-term exposure to low levels of toxin

Carcinogen (causes cancer), Mutagen (causes DNA mutations), Teratogen (causes birth defects)

Diseases

Pathogens: viruses, bacteria, fungi, protozoa, parasitic worms ***KNOW EXAMPLES OF DISEASES

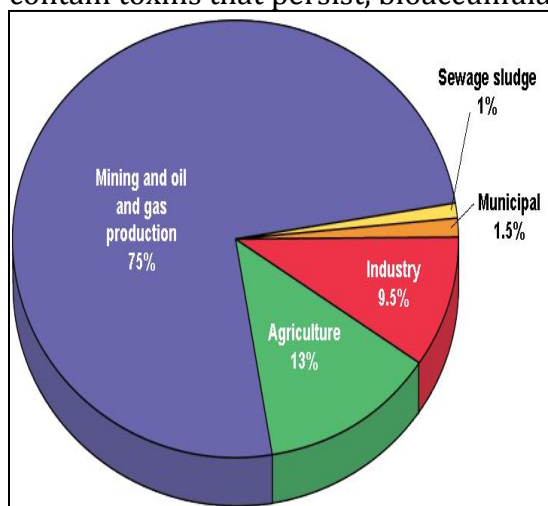
-Some need a VECTOR (ex: Marlaria, West Nile need a mosquito; Lyme Disease needs a tick)

-Transmissible/Non-transmissible

-Factors affecting transmission: poverty, population density, sanitation, climate (global warming!)

Waste

The US is responsible for 33% of the world's waste. The amount of waste is increasing due to increase in population, change in lifestyle, and disposable materials/excessive packaging. A lot of waste products contain toxins that persist, bioaccumulate, and biomagnify.



Estimated Decomposition Rates

Paper	Leaves	Orange Peel	Milk Carton	Plastic Bag
2-4 Weeks	1-3 Months	3-6 Months	5Years	10-20 Years
Aluminum Can	Plastic 6 Pk Ring	Plastic Bottle	Glass Bottle	Styrofoam
200-400 Years	400-500 Years	400-500 Years	500 Years-Forever?	Never?

Source: Penn State University, U.S. Bureau of Land Management

Methods of Waste Management

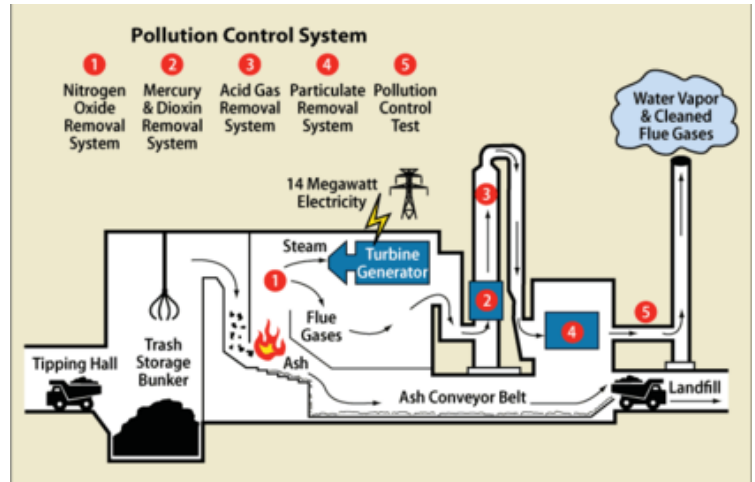
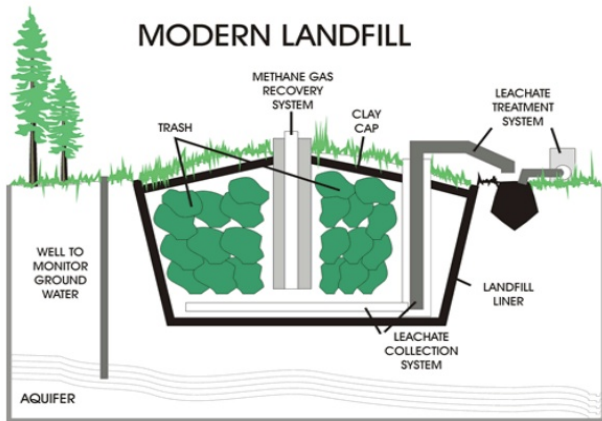
-Reduce/Reuse: most effective; minimizing use of products needing disposal

-Recycling

- Primary: recycled into same product (requires the least energy; ex: Aluminum cans)
- Secondary: recycled into different product (requires MORE energy)
- Types of Materials to Recycle (KNOW TYPES)
- Composting: replenishes nutrients to soil!

-Landfills: burying

- Open Dump (Old Landfills): leachate and methane released, pests... BAD
- Sanitary Landfills (Modern Landfills): Thin layers of trash, compacted and covered daily with soil and clay. Have methane recovery system, leachate collection, and groundwater monitoring.
- Issues with: Leachate can still leak into groundwater, slow decomposition of materials, release of GHGs (like methane!), trash getting out and collecting elsewhere (oceans)
- NIMBY



-Incineration: burning

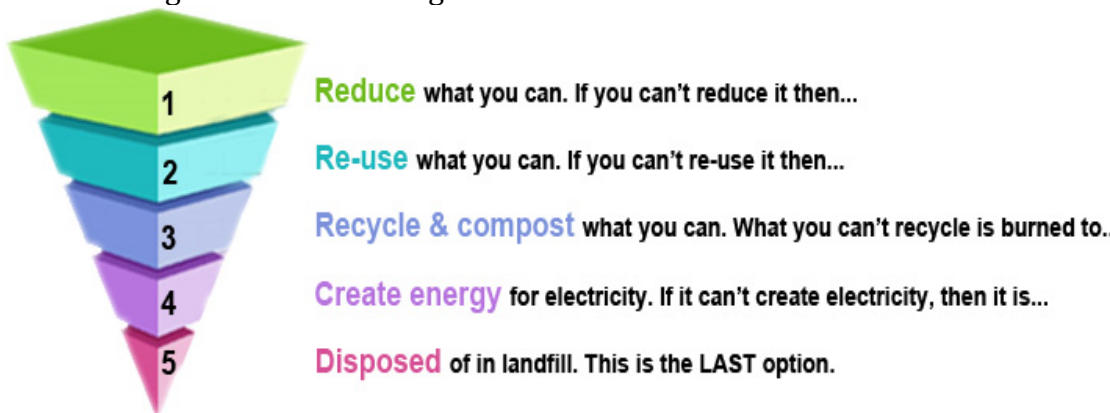
- Pros: less volume, heat can be trapped to generate electricity
- Cons: CO, particulates, and heavy metals into air (pollution!), ash (toxic!)
- *Some waste products burn better than others

-Hazardous Waste: (categories: corrosive, ignitable, reactive, and toxic)

- Examples: methylmercury, lead, PCBs, Dioxins, radioactive waste
- Hazardous Waste Landfills
- Surface Impoundment: creation of shallow, lined pools from which the substance evaporates
- Deep Well Injection: Drilling a hole below water table
- *Radioactive Waste: proposed site at Yucca Mountain in Nevada

Methods to Improve Waste

-Integrated Waste Management



Laws to Know:

- Toxic Substances Control Act
- Pollution Prevention Act
- Resource Conservation and Recovery Act
- Hazardous Materials Transportation Act
- CERCLA and Superfund Program (Love Canal)