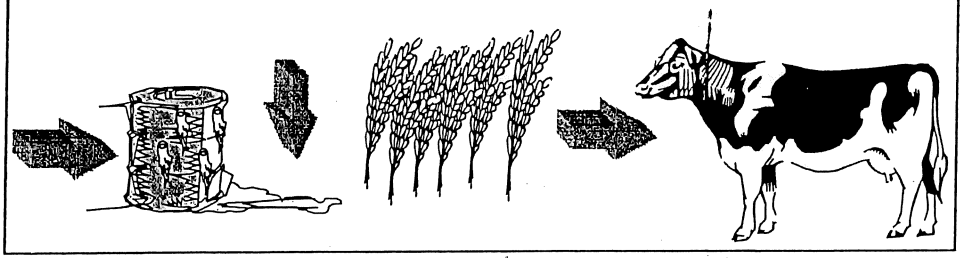
FOOD CHAIN (ingestion)

Depending on the chemical, we could potentially eat toxic food.



DERMAL EXPOSURE

- Entering the body through the skin.
- Substances that absorb through the skin sometimes further assimilate into the blood system.
- some chemicals are not absorbed easily unless the skin is cut
- others are absorbed quite readily regardless of the skin's condition
- use of proper gloves prevents skin contact/absorption through the skin

Inhalation

Breathing

- what is in the air which travels to the lungs.
- lungs are rich in blood vessels
- substances inhaled into the lungs often absorbed into the bloodstream
  - or may cause problems in the lung itself
- Warning properties are sensory clues (odor, irritation)
  - let us know a chemical's presence in the atmosphere--"rotten egg" smell of H2S
  - some substances have no warning properties

Injection

Direct chemical access under the skin

- Ex. - medical shots, needle sticks
- Injection can also occur accidentally.
  - skin cut by a contaminated can or a piece of glass.
  - Needle sticks
- Powerful means of exposure
  - contaminant enters the bloodstream *immediately.*

Dose-Response (D-R) Relationship

- The relationship between the degree of exposure (dose) and the magnitude of the effect (response).

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Dose-Response

Toxic dose low TD_{lo}

lowest dose (not inhaled) for effect except radiation

Toxic concentration low TC_{lo}

lowest toxic concentration via inhalation

Lethal dose low LD_{lo}

lowest dose to kill 10% of the test population (LD_{10})

Lethal dose 50% LD_{50}

administered dose that kills 50% of the test population

Lethal concentration low in air LC_{lo}

lowest inhaled concentration to kill a test animal

Lethal concentration 50% LC_{50}

concentration that kills 50% of the test population

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Dose Units

- Quantity of chemical per unit mass of body weight (i.e., mg/kg)
- Quantity of chemical per unit area of skin surface (mg/m^2)

LD_{50}

- The dose of chemical that causes death in 50 percent of the test animals.
  - Approximate oral LD_{50} in rats often used

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LETHAL DOSE - LD_{50}

- **LD50 for a substance is established by repeated experiments with animals**
- substance's effect on humans is ***extrapolated*** to determine what the LD50 would be for humans.
- **results are adjusted to apply to human body weight and similar characteristics.**
- tests on animals cannot predict the exact effect that the substance will have on a human population
  - **toxic substance often has different effects on different species**
- In addition, scientists study the effect of a substance on human populations wherever statistics are available.
- **<u>Another uncertainty</u> - most LD50 data is from acute exposure (single dose) rather than chronic testing**

LD_{50} (mg/kg)	AGENT
7060	ETHYL ALCOHOL
3000	SODIUM CHLORIDE
1760	NAPHTHALENE
1500	FERROUS SULFATE
1000	ASPIRIN
800	FORMALDEHYDE
350	AMMONIA
350	DEXTROMETHORPHAN HYDROBROMIDE
192	CAFFEINE
150	PHENOBARBITAL
118	CHLORPHENIRAMINE MALEATE
100	DDT
2	STRYCHNINE SULFATE
1	NICOTINE
0.0001	DIOXIN
0.00001	BOTULINUS TOXIN